# POPULAR AVIATION

Combined With

Aeronautics

*A magazine for everyone interested in Gliders—Lightplanes—Models*

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# *The* LUCKIEST MAN ALIVE

With best wishes
to a great magazine
Popular Aviation.
Keep up the good work.
Capt J. H. Hedley.

*By*

LIEUT. JOHN SAVAGE McHENRY, U. S. A. C. R.

**Twice Capt. Hedley miraculously escaped certain death. The story of his exploits is far more fascinating than fiction**

CAPT. J. H. HEDLEY'S experiences were undoubtedly some of the most thrilling and exciting of any of the war flyers. It is no wonder they call him "The Luckiest Man Alive."

Capt. Hedley joined the British Army the day war was declared. He was made a sergeant in the Northern Cyclist Battalion, a Newcastle upon Tyne unit, which was soon dedicated to home service. He did not like this home service idea, particularly after the German navy raided Hartlepool and Scarborough in Oct., 1914, and his battalion had been ordered to stand on the beach and fire their .303 bullets from small rifles at the sides of the German ships. As Capt. Hedley later explained, "I felt like we were 'playing' soldiers." He called a meeting of the soldiers—drew up a petition to his commanding officer, politely requesting to be transferred to a "fighting unit" preferably in France.

For this he was placed under arrest and reprimanded. But the plucky fighter did not remain under arrest for long. On Dec. 31, 1914, he deserted, and joined Kitchener's Army one day later. After about two years spent in the trenches, he finally managed to be transferred to take up duties with the Royal Flying Corps early in 1917. His career in this unit lasted until he was taken prisoner on March 27, 1918.

Officers transferring from another unit in France were required to go straight to a flying unit in France and serve some time as aerial observer, before being allowed to go to England for training as pilots.

Capt. Hedley served his apprenticeship as observer, and then went on to Oxford when he received his pilot's training course. He was then transferred back to the front and for six months prior to his capture he served with the Number Twenty Squadron, Royal Flying Corps, the most famous flying unit in the Royal Flying Corps.

Capt. Hedley's record with this unit up to the time he was defeated, consisted of 53 combats; three times he fought the famous Richthofen circus. He was officially credited with bringing down out of control or destroying 12 enemy aircraft and destroying one enemy captive balloon.

On Jan. 6, 1918, Capt. Hedley met with an accident that is absolutely unique in the annals of aviation. It is the accident which earned him his "Luckiest Man in the World" title. And what man alive has better claim to it?

WHILE he was flying over the German lines at 19,000 ft. altitude on this memorable day, an enemy ship loomed up overhead. It immediately dove down on the British airmen. Capt. Hedley was at this time acting as observer, and was sitting in the rear cockpit. He instantly gripped his swivel machine gun and tried to get the German plane in his range of fire.

Observers were not strapped into the planes nor did they wear parachutes. For that reason they could very easily swing their guns around, and themselves move around in the rear cockpit. Observers communicated with their pilot by tapping the pilot on the back of his head, thus signifying that the plane should dive.

The German was 35 to 40 feet behind and about 20 feet above the Englishman, he was diving zigzag towards them, wide open and gaining on them. His machine guns were sputtering bullets. Capt. Hedley was standing up facing backwards with his machine gun belching fire right back at his opponent. The German suddenly zoomed right down on the Englishman and then pulled almost straight up, evidently preparing to loop and take another dive on them.

When the German took his last zoom and pulled up, Capt. Hedley tried to follow him with his machine guns and in so doing he leaned his head back so far that he accidentally bumped the pilot's head. To the pilot this was a sign to dive straight down about 400 ft. and then level off again, and so the pilot pushed the stick all the way forward and started a terrific dive.

Capt. Hedley was not expecting any such maneuver, and when the plane snapped down in its dive, it threw Captain Hedley completely out of the plane, into the air. Imagine if you can, being thrown out of an airplane three miles above the earth, with no parachute, and ever hoping to live to tell about it. However, by some miraculous coincidence, Capt. Hedley fell about 400 ft. in direct line with the falling plane and when the plane leveled off after its dive, Capt. Hedley lit, straddling the fuselage of the plane close to the tail!

The pilot did not know that his observer had even fallen out. When he felt the jolt on the tail of the plane he looked around, and to his amazement saw his observer facing backwards on the tail. The pilot had no idea how he ever got in that position.

The only words that can adequately describe Capt. Hedley's feelings during this greatest of all falls, must come from Capt. Hedley.

"When I was thrown out of the plane, my helmet slipped down over my eyes and I couldn't see anything. I didn't know what had happened until I felt myself straddling something. When I slipped my helmet off my eyes, I realized where I was but had no idea how I got there. The hardest job I ever had was in crawling backwards, back into that cockpit that looked to be a mile away as I stealthily glanced back over my shoulder towards the cockpit."

Had it not been that another flyer had actually seen what had happened, Capt. Hedley might not have been sure

just what did take place. This thrilling coincidence is positively authenticated by Lieut. R. C. Purvis, Recording Officer of 20th Squadron, R. F. C., who tersely reported: "Jan. 6, 1918, Mach. No. 7255. Height 19,000 ft. Lt. Makepeace, M. C., reports Capt. J. H. Hedley accidentally thrown into air, afterwards alighted on tail same machine and rescued."

### The Fight with Richthofen

CAPT. HEDLEY, however, was not flying pursuit type ships or his record would doubtlessly have been greater. He was assigned to attack work, that is attacking enemy infantry to harass and keep them from advancing. At this he was most successful, although he wasn't able to add a long list of victims to his credit as did many of his fellow flyers who flew pursuit ships.

Capt. Hedley was doing such good work for the Allies, that Richthofen's Flying Circus had attacked him three times. The third attack came near ending the Englishman's career.

It was on March 27, 1918, that it occurred. The ships used by the famous Number 20 Squadron were Bristol Fighters, each powered with a 275 h. p. Rolls Royce engine. Those planes really could fly but they were meant to be flown for duty at about 15,000 ft. altitude.

The weather in March, 1918, when the last great German offensive was under way, was certainly not suited to the Bristol Fighters. The clouds were so low that it was necessary in doing this road straffing to fly at a height of less than 200 feet. At high altitudes these planes would respond to the slightest touch on the controls, but at 200 ft. they were slow and clumsy.

Such were the conditions on that day, March 27, 1918, when Capt. Hedley was road straffing over the lines, along with a few other planes from his Squadron.

All of a sudden from out of the low-hanging clouds came six German planes of Staffel Eleven, Von Richthofen's Flying Circus. Von Richthofen himself picked out Capt. Hedley's plane and approached to within 50 yards of his machine. Capt. Hedley's own story about this last fight with Von Richthofen is almost as thrilling as his famous fall.

"When I looked around I saw *the* big red Fokker right on my tail. Instantly, I knew it was the Famous Red Knight of Germany and that I must fight like I never fought before. Diving a little to gain speed, then pulling the stick all the way back, zooming upwards, a wing over, anything and everything to get that flying Uhlan off my tail. It was certain death if I couldn't get out of that position.

"This last maneuver gained me but little altitude. The Fokker was still right on me. I knew I couldn't combat on equal terms with the greatest of all German aces, for he was in a much

**Suddenly Capt. Hedley was catapulted from his cockpit. Three miles above the earth, and no parachute! Yet he lived to be shot down by Richthofen.**

The artist's diagram shows exactly how Capt. Hedley fell from his ship, and miraculously escaped from death.

faster plane. My only salvation was to gain considerable altitude, and get to the point where my Bristol ship would operate most efficiently. Again I tried the Immelmann turn, keeping the throttle wide open and straining every part of the ship, but the red Fokker couldn't be shaken off. I then realized I could never get the necessary altitude."

What was there to do? So far Von Richthofen had not been in quite a good enough position to open fire, but he was constantly getting closer and closer. Von Richthofen rarely used a lot of ammunition, he waited until he was in a perfect position and then pulled his machine gun trigger. Rarely had anyone escaped when Richthofen started firing.

Capt. Hedley knew this. When would this flying Uhlan start his firing? It was known that Richthofen had shot down his 71st plane at about the same place that very morning. Would he be the 72nd? All this went through Capt. Hedley's mind as he was zigzagging, twisting, making a fast, quick dive, then turning again. He couldn't try for altitude, Richthofen had almost got him at this trick before. There was only one thing to do, that was to try to get back of his lines. Hardly had he turned in that direction, when bullet holes began to appear in the wings of his plane.

"Richthofen had started shooting. Was there a chance to escape? I started a terrific dive but just as I did so, one of the petrol tanks was riddled. I had to stop my dive for this would only help a fire start. No sooner had I pulled back on the stick than the other petrol tank was hit, flames now shot out and thinking there was not a chance left I started my last mad rush to earth with the hope that I might land or crack up behind friendly lines."

THE Bristol plane did not make it, for it came down in "No Man's Land," with flames enveloping one side. However, as it landed it did not crack and Capt. Hedley and his observer managed to jump clear of the burning plane. Immediately a bombardment started in from a field gun brigade which destroyed what was left of the plane.

Capt. Hedley and his observer were surrounded by Germans, manhandled and relieved of everything but their coats and shirts and then made prisoners of war.

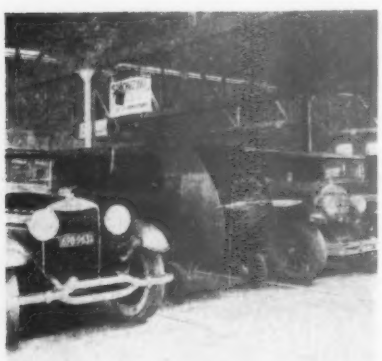
Baron Von Richthofen's official report after this fight was as follows:

**Requesting Acknowledgment of My 72nd Victory:**

Date: *March 27, 1918.*
Time: *4:30 P. M.*
Place: *Two kilometers west of Foucancourt.*
Plane: *Bristol Fighter, two seater. Burned.*
*With six machines of Staffel Eleven, I attacked some enemy infantry flyers who were molesting our advance movements on the ground. I managed to approach unnoticed to within 50 yards of a Bristol Fighter and succeeded in shooting it down with 100 shots. The machine went down smoking and touched the ground near some German columns.*

Baron Von Richthofen.

With this victory for the Red Knight of Germany, ends the war-flying experiences of Capt. Hedley. His only remark about why he was shot down is as follows: "I haven't any alibi to offer for the calamity that happened on March 27, 1918. I must admit I was outgeneraled by a better man than I, but if I could have had my choice in the matter I would have chosen none other than the great German Ace, Baron Von Richthofen, to give me a licking."



## Little Ship Slips Gracefully Into Ordinary Garage

ALL this Heath Parasol needs is a pair of fenders and headlights to make it fit in perfectly with its surroundings.

It has been estimated many times that this plane would require the same space as an automobile. Here is pictorial proof. It can be clearly seen that this plane fits in, with room to spare, between the two white line markers, where automobiles are usually kept.

## Mechanic Builds Own Ship

BALTHASAR GOLDSTEIN, a motor mechanic of the Saar district, has completed building his own engine and airplane. He has spent for it no more than a good motor car would cost, and has a handy little plane that is proving altogether dependable.

## Updraft Nearly Wrecks Plane

WHEN an updraft raised his American Eagle from 600 feet to an altitude of more than 7,500 feet in less than a minute, B. T. Flannery of Chanute, Kas., recorded experiences sufficient to thrill the most blase.

Flying toward Kansas City, Flannery ran into a wind storm south of Olathe, Kas. Heading for what appeared to be an opening in the clouds, he plunged into an updraft. Flannery reports he nosed the plane downward under full power but to no avail. In less than a minute the ship had gained more than 7,000 feet altitude and was out of the storm sector and over Lawrence, Kas., more than twenty miles off its course.

"We were on our backs one instant and right side up the next," Flannery says. "It was a real thrill but there was nothing particularly dangerous

## Rocket Model Wins First Prize

GILBERT WESTPHAL is another American youth to perfect a practical model of a rocket plane. He is shown with his miniature powered-plane which won first prize for him in a contest conducted by the Los Angeles Playground Department. The baby plane takes off and sustains flight for about thirty seconds, covering 350 feet under the power of its self-contained "rocket cartridge."

## Why Pilots Fly Upside Down in Fog

MANY an experienced pilot has entered a cloud bank flying steadily on an even keel, only to emerge on the other side a few seconds later totally upside down or standing on wing ends. Without having the actual experience, we would naturally smile at this statement, for it would seem that the shifting of our weight on the seat, or the tightening of our harness, would be ample warning of a departure from the horizontal, but such is not the case. It rather seems that a complete understanding of our attitude in respect to the horizontal depends upon the eyesight rather than any other sense of feeling or mental process, and this peculiar condition has led to thousands of mix-ups in the past as it will continue to do in the future if some remedy is not found for the trouble.

Just at this point it might be interesting for you to perform a simple experiment based upon one of the physical tests made by the U. S. Department of Commerce. Draw a straight chalk line on the floor about twenty feet long, or else stretch a white string or cord of this length to take the place of the chalk mark. Now stand at one end of the mark, take a good look at it, and then after blindfolding yourself try to walk along the mark. After you have walked blindfolded for a distance judged equal to the length of the mark, remove the blindfold. In nine cases out of ten you will be disagreeably surprised to see how far you are from the mark at the end of this short walk.

Next, imagine that you are flying blindfolded in an airplane with all sight cut off by the fog or clouds, and then estimate the amount that you would be off the straight course flying at the rate of 100 miles per hour at the end of ten minutes! We assume, of course, that there is no compass, or else that the compass is out of order, which is very frequently the case.

For the test of the horizontal sense. Stand on one foot with the other foot up and hooked behind you, eyes open and free to refer to surrounding objects. If you are in ordinary physical condition you will have little difficulty in holding this pose for 20 or even 30 seconds without much waverings. The blindfold test is not so easy to pass. Still standing on one foot as before, blindfold yourself or shut your eyes, and attempt to hold this pose for 15 seconds while blinded. If you can hold this pose for 15 seconds, without excessive wavering to regain your balance while blindfolded, you are acceptable to the U. S. Department of Commerce for this particular test. However, we defy you to stand perfectly still for 30 seconds when blindfolded!

These simple little tests are mute evidence of the tendency toward going astray when the line of vision is cut off by fogs or clouds.

Top, the Senior class poised for their Valedictory cross-country hop. Below, two other views of the collegiate campus at Curtiss-Wright Flying Service on the West Coast.

## Flying Schools Offer Real College Life

COLLEGE spirit, college pranks, college atmosphere—all are part of the nation's great air universities. The campuses, too, vie with the orthodox conception of what a campus should be. Students, arm in arm and singly.

Co-eds of the air admiring the more successful gentlemen students, either stand at the edge of the campus waving, or, clad in wind-proof uniforms, themselves climb into planes waiting "on the line" to go aloft with their professors, most of whom are graduates of the Army and Navy schools and who exact an almost military attitude on the part of the undergraduates.

One particular school on the west coast has developed the idea of a valedictory flight into an extensive cross-country course. The senior class parades a thousand miles over the western states, alighting at numerous airports for overnight visits, and carrying the name of alma mater to every village and town.

## Aeronca Pontoons Are Smallest Ever Built

THE smallest airplane pontoons ever made have been completed by the Aircraft Products Corp. for the little Aeronca.

The pontoons are 11 feet long, and weigh only 40 pounds each. They are designed exactly as the largest pair of pontoons made for the giant Ford tri-motor.

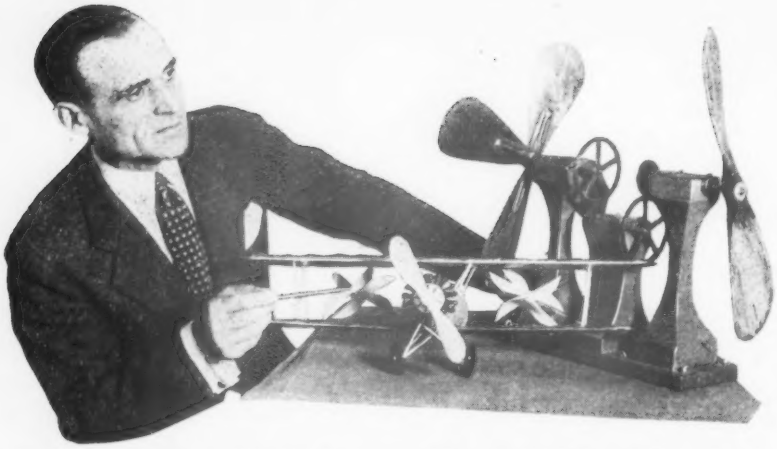
The pontoons are streamlined throughout and give the Aeronca unusually good performance on the water. The takeoff with only a pilot aboard averaged 15 seconds. An exhibition flight was made with one passenger, and the little ship got off in about a minute.

The pontoons are bolted throughout, and constructed over a frame of airplant spruce and mahogany. Alclad metal is used for the skin, and three water-tight bulkheads are fitted. The concave V-type bottom prevents spray, and makes for a smooth landing and takeoff even in choppy water.

## Airplane Starts Football Game

AT a football match held in Adelaide, South Australia, in aid of charity, a De Haviland plane flew low over the field and dropped the ball, so starting the play. Although the football is a tricky object to throw from a speeding plane, it landed within a few feet of the circle marking the center of the ground. It is believed that this is the first time a football match has been started in this way.

XUM



## Unique Design Has Extra Propellers

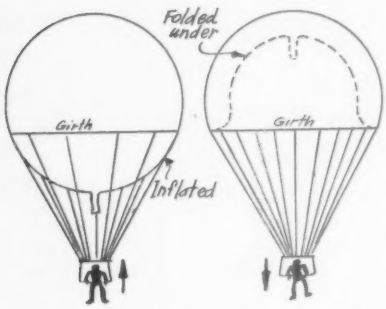
ALEXANDER ALTIERI is shown with his new invention, the "landing auxiliary propeller," which, he asserts, will prevent all nose dives and will aid the flyer striking air pockets. At right is a working model of the two-blade prop, placed on the plane as shown in the model. They will weigh but 15 to 20 pounds.

## 'Plane Wedding Popular

AS AN advertisement, a theatrical company in Melbourne, Victoria, Australia, recently made an offer for a couple to be married in a plane flying over that city. Over forty applications were received, including some from girls who were not even engaged, but they told the manager not to let that worry him as they could easily get someone before the time of the flight!

## A Balloon That Acts As Its Own Parachute

MANY attempts have been made, from time to time, to protect the life of balloonists in case that the bag should become deflated either through accident or by the injudicious use of




the maneuver valve. The first safety device was the parachute, which is extensively used today for both dirigibles and airplanes although it was invented prior to the year 1810. Parachute jumps were very common in the days of the hot-air circus balloon, for this device was about the only practicable arrangement that permitted the safe escape of the aeronaut after the gases cooled down and the bag started to turn over. Many of our older readers will remember these thrilling circus stunts.

The parachute adds a considerable amount of weight and this is always objectionable in ballooning, whether it be a hot-air or hydrogen filled envelope.

With these thoughts in mind, a balloon has been recently devised that acts as its own parachute automatically, and parachutes to earth without making it necessary for the aeronaut to jump overboard or to make any changes or adjustments whatever when the bag becomes deflated.

As seen in the first figure, this is an ordinary spherical balloon with a light steel cable girth ring run around at a point slightly below the equator. Attached to this ring are the lines running down for the support of the basket, and the girth ring is therefore depended upon for carrying the full load and then transmitting this load to the envelope. When fully inflated, the balloon acts just like any other balloon.

Now, in the second figure we see what happens when the balloon becomes deflated and starts to descend. The pressure is released at all points on the circumference below the equator, and the air pressure created by the downward motion drives the lower portion of the envelope up into the taut section above the girth ring as indicated by the dotted lines.

The balloon envelope now becomes an effective parachute by the simple release of pressure in the bag and by the air pressure outside of it. This, of course, is automatic and the operation is completely accomplished without the attention of the balloonist. Further, and of the greatest importance to the owner, all parts of the balloon descend together at one point and there is no need for chasing the bag after landing.

## Hectic Signals Finally Warn Pilot of Danger

MITCHELL FIELD, N. Y., boasts of a rapid-fire sign painter whose proficiency in this direction was the means of preventing what might possibly have turned out to be a serious accident.

Shortly before noon on May 26th, a commercial pilot left Trumbull Field, New London, Conn., and just before he cleared the ground the right wheel of the landing gear of his plane gave way. Unmindful of his predicament, the pilot continued blissfully on his way. His danger was evident to everyone on the ground, but not a single ship was down which could overtake him and warn him of the trouble.

Before the ship had gone more than a few miles, Lieut. S. E. Anderson landed and was immediately sent out after him. In the interim of several seconds between the takeoff of Lieut. Anderson and the landing of Lieut. Donald (Bobo) Baxter in another O-1E, Lieut. "Pete" Peterson, of border fame and otherwise known as "Zoom," conceived the idea of painting a sign on the side of the next ship that came down. No sooner had Baxter taxied up to the line than "Pete" was slapping huge letters on the side of the ship—LANDING GEAR BROKEN—following which Baxter was on his way again. The crippled Aeromarine plane was overtaken and, although the wet paint had smeared until it was barely distinguishable, the pilot divined its meaning, saw the broken wheel and waved understandingly.

The same afternoon a report came in from Providence, R. I., to the effect that the ship had landed without harm to either pilot or passenger.

## Unusual Parachute Picture

THIS unusually thrilling picture shows the parachute jumper on the tip of the plane wing just about to step off into space as his 'chute opens. Note that the jumper seems perched on his right toe as he is swept backward off

the plane. This was but one of the thrillers at the Royal Air Force pageant at Hendon, England.

# Mysteries of the Upper Air Revealed

*By* CDR. DOUGLAS G. JEFFREY, D. S. O., R. N. R.

WE HEAR a lot now-a-days about upper air research. A vast number of observations have been taken with the aid of kites, balloons and planes equipped with self-recording instruments, but how much do we actually know about our atmosphere and more particularly the "upper air?"

So far from investigating the upper air all that has been done in the last twenty-five years (it was at that time that interest in what we today term aerology was first evinced) is to grope about at the bottom of the immense aerial ocean which envelopes the earth.

The atmosphere is probably some 200 miles in height, or should we say depth, so that to date exploration has been confined to the merest fraction of the whole area. The greatest height ever attained by a kite is six and a half miles and by a sounding balloon twenty-two miles, while there is a somewhat hazy report of a pilot balloon that actually attained a height of twenty-four miles, somewhere in the vicinity of Greenland. The airplane altitude record at present stands at 43,000 feet, approximately eight miles. This is undoubtedly a wonderful achievement; but when we consider two hundred miles of atmosphere, it seems to sink into insignificance.

The records obtained from kites, balloons and planes have, however, established the fact that there are two distinct layers immediately above our earth, the lower has been named the troposphere and the upper, the stratosphere. The first named extends to a height of from six to seven miles and has a complete monopoly of what we know as weather, namely storms, rain, snow, etc., etc. From the earth's surface to the limits of the troposphere there is a more or less constant fall of temperature, averaging about one degree to every three hundred feet of altitude, until at approximately seven miles an average of 63°F below zero is reached.

ABOVE this lower portion of the straposphere there is, according to some leading British authorities, a "warm blanket" extending up to approximately one hundred miles, where the temperature equals that of an average summer day. Some scientists place this blanket between thirty and one hundred miles of altitude. Beyond the hundred-mile mark there exists cold that it is impossible for the human being to realize—probably 459°F below zero. Air becomes liquid at 319°F and therefore cannot exist as a

**100-200 miles. An electric light could not penetrate the perpetual darkness. The terrific cold (—459oF) liquifies the air so that it pours like water.**

**50 miles. There is just enough air to reflect light dimly, producing a perpetual twilight. There is no more air than would be found under an efficient air pump.**

**25 miles. Here the first blue tint of the skies can be seen. There is a deathlike stillness and an intense cold. The wind sock sags due to the complete calm existing at this altitude. A clanging bell cannot be heard.**

**7½ miles. Temperature 70oF below zero. The weather offers very little variation in temperature. The altitude record for airplanes is approximately 8 miles. Kites have been flown to 7 miles, as have balloons with passengers.**

**1½ miles. About 26oF cooler than at earth's surface. Day temperature is a little cooler than night.**

**1000 feet. (5280 feet to the mile). Approximately 15oF cooler than on the ground. Few germs or bacteria exist beyond this level. The Eiffel tower is now the highest structure in the world (1020 feet) but will be surpassed by the new Empire State Building now being constructed in New York.**

gas in this region, but becomes liquified and assumes much the same general appearance, color and specific gravity as water, a vast ocean of liquid air bathed in perpetual night.

This matter of light or lack of it is hard to explain in simple langauge; but the basic cause of it is the absence of dust motes or molecules of air, which in the lower strata serve to break the sun's rays up into light, heat and electricity. Close to the earth these dust motes are ever present, though invisible, and average many millions per cubic centimeter. Hence our sunshine. Experiments have been made to demonstrate this interesting fact. The most powerful light known to science if directed into an enclosed volume of air, from which all dust motes have been eliminated, will fail to show any illumination.

Professor Willis Moore, the well-known American authority on meteorology, does not agree with his British confrerees regarding the warm blanket and in describing the region between 25 miles of altitude and 100 miles states that at twenty-five miles "Air light as it is, has still sufficient density to obstruct the passage of the minutest wave lengths of light, and here probably begins to be appreciable the blue tint of the heavenly vault. At this short distance from the earth there must be a deathlike stillness, for there is no medium sufficiently dense to transmit sound. Two persons could not hear each other speak, even if they could live in this rare atmosphere, which they could not. Here is eternal peace and no apparent motion, for storms and ascending and descending currents cease long before this level is reached. The cold is intense and daylight but a feeble illumination. There are no clouds."

Describing the conditions at fifty miles height the same authority states: "There is enough air here to refract light slightly as at twilight, and to render luminous the meteors that rush with fearful velocity against its widely scattered molecules. At this distance from the earth there is probably no more air than would be found under the receiver of the best air pump, and the reader will be surprised to learn darkness is practically complete, although the hour may be midday, for there are no dust motes to scatter and diffuse and render visible the light rays of the sun." Both British and American authorities agree, however, regarding the conditions beyond the 100-mile limit.

SOME of the most interesting phenomena that are visible to man are to be found below the 100-mile mark. The Northern Lights that we have all watched and admired, and which are still a mystery to the scientists, are within this area and have their origin about sixty miles up, although they appear to the observer to radiate from the lower atmosphere.

At a height of about 37 miles we encounter the "ozone blanket." Some of my readers will remember, back in pre-war days, the ozone advertisements that appeared in connection with many seaside resorts on the assumption that ozone was present in large quantities close to the surface of the ocean. This is to some extent true, but the ozone in connection with seaside resorts was just enterprising advertisement and had little relation to fact.

Ozone is beneficial in small quantities but in a condensed form it would have a very irritating effect on the lungs and respiratory organs generally, and quite a small amount would cause death. So perhaps it is just as well that the ozone blanket is 37 miles above us. It does, however, perform one very useful and important function—it absorbs large quantities of the sun's ultra-violet rays and prevents mankind from suffering from an overdose of violet ray treatment, which would prove much more harmful than too little of this much advertised "cure."

At two hundred miles altitude, believed to be the limit of the atmosphere, we have unbelievable cold, total darkness, ether, invisible and intangible and incapable of measurement by any instruments yet devised. Beyond this two hundred mile line is space, void, call it what you will, without temperature or light but still containing "something" that carries on the transmitting of solar rays to this old earth of ours.

THERE are many interesting possibilities in the atmosphere much nearer home, which despite the vagaries of our weather, is far more congenial than the regions described above. At one and a half miles up, for instance, there is but little difference between the day and night temperatures, but the coolest time of the twenty-four hours is during the daytime and not at night as might be supposed. This is important both to the airplane pilot and the lighter-than-air operator.

To get a little nearer home yet—we know that the temperature in the troposphere (the first seven miles) decreases about one degree for every three hundred feet of altitude and also the higher we get the bacteria of disease and putrefaction decrease. At an altitude of only a thousand feet, free air has at times been found to be as much as fifteen degrees cooler than on the ground. This sounds like a contradiction of the one degree for every 300 feet; but this figure is an average and does not apply universally.

Here I am going to quote Professor Moore once again: "Almost within the arm's length of the streets of great inland cities, there is a cool and healthful atmosphere when humanity is sweltering and dying from the heat below. Some youth who is reading this may develop the genius that will lift whole city blocks into this cool and healthful region."

This is just a very brief, and as far as is possible, simple analysis of our atmosphere and no attempt has been made to give the why and the wherefore of things. It will, I hope, interest some of my readers in the wonders that exist in the atmosphere and also demonstrate that great as is the progress that has been made, it is infinitesimal when compared with the vast expanse of the atmosphere about which we as yet know practically nothing.

The possibilities of aerial exploration are just as interesting and may possibly prove more beneficial to mankind than the conquering of the Polar regions or the opening up of African jungles.

## THE MAN WHO JUMPED WITH CRUTCHES

**Rather than disappoint an expectant crowd, this intrepid airman performed a feat new in the annals of aviation.**

THE above picture shows Dick Powell just before he made what is believed to be the only parachute jump ever made on crutches.

Dick Powell has been a stunt flyer and parachute jumper for twelve years. He has some 2000 parachute jumps to his credit and as a result has gotten to the point where it is just one jump after another. A plain jump isn't the least bit exciting to him any longer.

Several weeks before the event pictured above, Dick Powell had agreed to make a parachute jump before a crowd of spectators at the Elmhurst Airport. A few days before he was to make this jump he broke his ankle and had to have it put into a cast.

The day of the jump came around and Dick appeared at the airport. To everyone's surprise he was on crutches, with one foot in a cast. And to surprise everyone still more, he put on his parachute just as though nothing were wrong and prepared to make his jump.

To make a long story short he jumped from an altitude of 3000 feet and purposely fell 1000 feet before pulling the rip cord. The chute opened O. K. and Dick made a nice landing on one foot and a crutch.

## Farmer Offers Field for Pilots

A FARMER living near Attica, New York, a town not far from Buffalo, is going to win the everlasting gratitude of flying people if a plan he has broached becomes a reality.

The farmer who, incidentally, has never had an airplane ride in his life, is W. J. Orr, and he is willing to donate a large plot of land on his farm to be used as an emergency landing field. The land is smooth as a table, a sort of a plateau, and a natural landing field. Mr. Orr suggests that farmers throughout the United States set aside waste land for emergency landing fields, as he is convinced there is a great shortage of land on which fliers in any kind of trouble might come to earth safely.

On many days, Mr. Orr says, as many as twelve or fifteen planes fly directly over the field, and if it were marked, they easily could use it in emergencies.

Mr. Orr's offer followed an accident near Attica a short time ago in which three Detroit aviators were killed when their plane struck a hillside after becoming lost in a storm. Residents say the plane circled the vicinity of Attica fully an hour before crashing, apparently hunting for a suitable landing plot.

## Autos Identified from Air

**Flying executives can readily spot their traveling salesmen by the use of the novel identification on the roof of the car.**

P. S. ABBOTT, a business man of California, uses an Arrow airplane to tour his territory and contact with his sales force. Every one of his company's large fleet of Reo automobiles is decorated with a large "E" stretching over the entire top, so that Mr. Abbott can readily identify his salesmen's cars on the road as he approaches the various airports.

## New Beacon Aid to Pilots

TO give warning to low-flying aviators, a neon obstruction marker has been mounted on top of the new 40-story Cathedral of Learning building of the University of Pittsburgh, Pittsburgh, Penna. The marker resembles a spread umbrella with six V-shaped neon tubes sloping downward from the center.

The covering above the tubes consists of a cone-shaped hood to which a wire screen is attached. This screen protects the tubes from hail, snow and other antics of the weather which might cause damage. The marker with its distinctive ball of red light, about three feet in diameter, is visible for a distance of three miles. Another unique feature is the fact that this marker is the first that can be lighted from high-voltage transmission lines.

An obstruction marker made up of neon tubes is an effective and inexpensive means of protecting tall chimneys, towers, monuments, broadcasting antennae, transmission towers, and bridges—as well as tall, unlighted buildings—from danger of collision at night by low-flying aircraft, the pilots of which either do not know that these obstructions exist or become confused as to their location.

# Do You Recognize the Army Insignia?

ARMY Air Corps airplanes are divided into eight classes, according to type or model. Although these planes are invariably known to the layman by their commercial names, the Air Corps knows them by their model designation, viz:

| | Model Designation |
|---|---|
| Pursuit (fighting planes) | P |
| Observation planes | O |
| Attack (ground strafing) planes | A |
| Transport, Cargo, Ambulance, Workshop planes | C |
| Bombardment planes | B |
| Primary Training planes | PT |
| Basic Training planes, used in transition from primary type to service type planes | BT |
| Photographic planes | F |

Airplanes on experimental and service test status are prefixed by the letters "X" and "Y." Thus a Pursuit type developed either at a factory or at the Air Corps Materiel Division at Wright Field, Dayton, Ohio, would be labeled "XP," followed by a number which would classify it according to its style, such as "XP-6" which was the experimental stage of a Pursuit plane made by the Curtiss Company somewhat on the style of the Curtiss "Hawk." If this experimental model proves to be of an acceptable type, a small lot is then bought and sent to some active station for service test; in other words, they are used in the service along with other Pursuit machines to test their serviceability and desirability. Such experimental planes would then be labeled "YP-6."

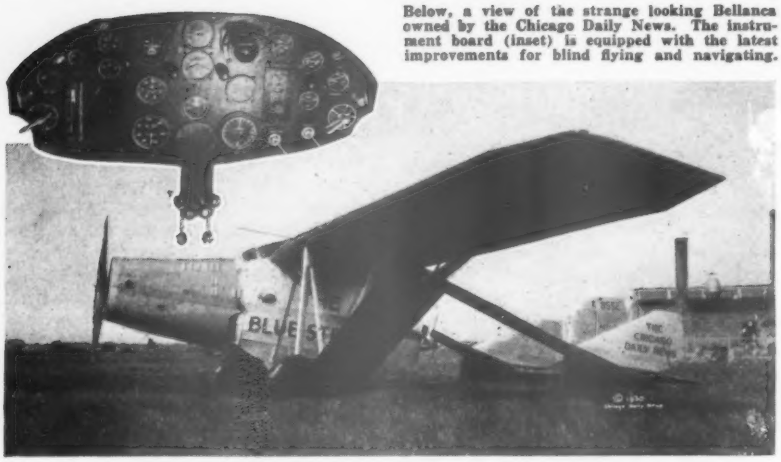
There are still some airplanes in the service which are known by an earlier system of model designation, such as the DH—DeHaviland, and the PW—Pursuit Water-cooled, but these are either obsolete or obsolescent.

**Above, the Douglas O2H. Note that all army planes carry a series of horizontal stripes on the rudder. The Navy planes carry three vertical stripes.**

**Below, the new Curtiss XBT-4. After you have read the accompanying article, you should be able to tell what each letter stands for.**

**Above, the Boeing P-12B. This Boeing high speed fighter is powered with a Wasp motor and was one of 19 army planes which recently established an altitude record for formation flying at 28,000 feet.**

XUM



Below, a view of the strange looking Bellanca owned by the Chicago Daily News. The instrument board (inset) is equipped with the latest improvements for blind flying and navigating.

## THE MYSTERIOUS "BLUE STREAK"

### Why Was It Built, and What Will It Do?

THE peculiar looking Bellanca owned by the *Chicago Daily News* has aroused considerable curiosity in Chicago. Everybody is on edge, wondering what sensational flight is scheduled to take place. It is confidently expected that the "Blue Streak" will soon startle the world but nobody seems to know just when or where the flight will take place.

Aeronautical experts seeing the *Chicago Daily News* tandem-engined Bellanca airplane, The Blue Streak, for the first time are amazed by its specifications and flying potentialities.

"It has been almost three years since I first called on Walter A. Strong, publisher of the *Chicago Daily News*," Pilot Short said today as he was preparing for his test flight, "and asked the *Daily News* to back me in aviation experiments which I believed would be of great value to aeronautics. We know in theory what it will do. What it will do in actual extensive tests we will know after this test flight. I believe we have an airplane which is capable of extraordinary performance."

The Blue Streak, named for the principal market and sporting edition of the *Daily News*, is known in the Bellanca factory as The Tandem because of its peculiar engine mounting. In the nose of the giant airplane are two Curtiss Conqueror water-cooled gasoline engines, specially built, which at 2,450 maximum flying revolutions per minute deliver a total of 1,398.9 horsepower. The engines are set back to back, the forward engine driving a thirteen-foot two-bladed wooden propeller, the rear engine driving a three-bladed metal propeller, nine feet in diameter. It is both a pusher and a puller for the rear propeller is mounted on a shaft running through the short cabin of the airplane.

Since motor failure is the greatest potential obstacle to successful flight, Pilot Short believed that a tandem-motored airplane capable of cruising on either motor alone or on both, would provide a greater safety factor.

"Why cannot such engines be made accessible in flight?" Mr. Strong asked. "If assistant pilots or mechanics could get at feed pipes, water connections and so on, make repairs to engines while in the air, safety would be greatly increased."

"I have such an airplane in mind," the calm-voiced Bellanca told Mr. Strong and Pilot Short. The result is The Blue Streak.

With a full load test of approximately 25,000 pounds, it is believed that The Blue Streak will be capable of a sustained, safe flight, without landing or refueling, of from 5,000 to 7,000 miles. Top speed 160 m. p. h.

## Butter-Fingered Pilot Drops Bomb

A BOMB jostled from the hand of a pilot fell in the midst of a crowd witnessing an aerial demonstration recently in Chunking, China, killing fourteen and injuring 106 persons. Among the dead were five government officials.

The mishap occurred when the pilot, a German named Frederickson, went aloft in an American Eagle biplane which had not been equipped with bombing racks. He carried a small bomb in his hand and intended to demonstrate to the government officials the efficiency of aircraft in bombing operations.

In some manner the bomb fell as the pilot attempted to fly the plane and carry the bomb in his free hand suspended over the side of the fuselage. It landed in the midst of the crowd.

The pilot received a sentence of one year and two months in prison, but the sentence was suspended for three years.

Brophy states there is a steadily increasing interest in aircraft in China, that new mail and transportation lines are being planned and opened and that many Chinese are taking flying instructions.

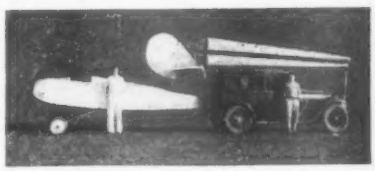
## New Light Ray Will Penetrate Fog

INVENTION of a light ray that is claimed by its inventor to have all the properties of sunlight, and which will be of invaluable use to aviation in penetrating fog, was recently announced in London. Experiments conducted in a dense fog revealed that figures could be seen passing in front of the beam, which were otherwise invisible in other beams.

Possibly the most striking feature was the test of brilliance. Set up on a stretch of road on a dark night, it was said to be possible to read newsprint at a distance of a mile and a quarter.

To produce the beam, oxygen from an ordinary container is first passed into another cylinder in which are certain chemicals in liquid form. This gas is fed to a burner and the flame when lighted impinges onto a pastile of thorium oxide, producing a brilliant white light. The installation was used in a reflector drum similar to a searchlight, and intensities up to 1,000,000 candle-power were obtained.

## Seen at the Newark Airport



The low-wing advanced type glider is seen stripped down for its trip home.

WE are very fortunate in having many readers who send photographs and suggestions to us for presentation to other readers.

J. G. Marinac sent us two photographs the other day, but was not very liberal with his description of what they were.

A novel home-made glider is shown on exhibit at the Newark Airport. It is obviously constructed with a future power plant in mind. The glider is carted from home to airport behind the owner's auto, an interesting method of carrying disassembled parts being used.

In the other view, the glider is completely assembled and is being balanced above the ground on a short stake. This whole thing looks rather queer to us, perhaps it is a new pole sitting contest. At any rate, Mr. Marinac promises us more information about this strange acting craft in his next communication.

The flight view of the model shows the unusual design of the hull with its fin-like keels.

# The Transoceanic Plane of the Future

*By*

HANS ROHRBACH*

This internationally famous designer offers an advance review of his latest flying boat

PLANS and description of what may be the world's greatest flying boat have been sent to POPULAR AVIATION by its famous German designer, Hans Rohrbach of Berlin. This is the first time that any information has been made public in the U. S. about this flying boat and POPULAR AVIATION is more than pleased to offer this to its readers.

Mr. Hans Rohrbach is one of the most eminent inventors and engineers of the present generation in Germany. Some of his most remarkable achievements resulted in the construction of the new Rohrbach Reaction Motor being built at the present time in England, and also the new hot air engine on the order of a Diesel type which is to be used by two of the most prominent German steamship companies. He has kept the engineering world of Europe amazed and startled by the origination of new design of motor vehicles.

Rohrbach at the age of 23 was a flyer in the German Flying Corps during the Great War. Due to his unusual capacity he was withdrawn from the Front and made Chief Engineer in the German L. V. G., where he worked entirely in the developing and designing of aircraft. For some time after the war he worked with his brother, Dr. Adolph Rohrbach, in the construction of large land and particularly seaplanes and is responsible for many improvements of the well-known Rohrbach planes.

Without question, however, one of his greatest achievements is in the design of his new flying boat as presented here.

In the accompanying photographs of an exact scale model of this great craft one is immediately impressed by its clean-cut streamlined appearance.

This giant future transoceanic flyer is built as a monoplane with wings of decidedly the cantilever type. The wings are not laid down upon the boat as is the customary construction, but are joined squarely to the sides of the hull, extending outward flush from the top streamline, quite similar to the way the wings of a bird extend laterally from its body. In this way about five feet are cut from the usual building height of the plane. This design reduces to quite an extent the weight of the wings and also the net weight acting upon them. The total wing area is 708 square feet, the wing span being 147 feet. The depth of the wing at the juncture with the fuselage or body is 39 feet and its thickness at that point is over five feet. This dimension permits part of the wing adjacent to the body to be used for the convenience of the passenger. Large windows are provided in this part of the wing.

POSSIBLY one of the most significant departures from the present conventional type aircraft is the location of the motors to be used in this great flying boat. They are placed in the bottom of the boat, below the water line. Besides the engines, all other heavy weights, such as tanks for fuel and oil, are also mounted below in the hull.

The drive of the engines is transmitted to the propellers, which are located well up on the wing and boat-deck, by shafts and reduction gears. The use of such shafts and gears is in itself nothing revolutionary. The losses involved in the use of these are more than offset by the better pulling effect of the slower propellers.

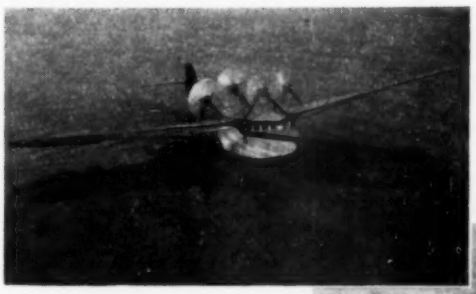
The radical change in the mounting of the engines from the conventional position of placing them just below or above the wing, appears to be greatly advantageous.

The most notable change for the better is in the greatly lowered center of gravity. Considering the enormous weight of the four engines, each of 800 h. p., amounting to some four tons, and also the addition of approximately five tons of fuel and oil, it is unquestionably better to have this mass of weight placed with its center of gravity within the boat itself. This will add greatly to the ship's stability and buoyancy in the air. With the installation of this weight below the water line there is insured absolute buoyancy and adequate ballast when the ship is in the water, so much so that pontoons have been dispensed with altogether. Elimination of pontoons, besides dispensing with considerable dead weight, cuts down a great deal of air resistance and also water resistance.

Engines mounted on the wings or otherwise placed outwardly in relation to the boat hull cause considerable air resistance, and call for very heavy weights for engine supports. Besides the elimination of the air resistance and the lowered center of gravity much weight is actually reduced by placing the motors below in the boat. All elimination of this dead weight helps that much more in increasing the useful load of the plane.

With the motors placed below in an engine room set off apart from the rest of the ship, as Rohrbach has designed his flying boat, it allows the possibility of working effectively on the engines while the plane is in flight. The engine room is over six feet in height, which allows the mechanics to make any necessary repairs without the slightest difficulty. Although it has been said about other designed flying boats that repairs could be made on the motors while in flight, none of them have ever before had an engine room designed whereby all the motors are actually accessible from the inside as is

*Translated and summarized from the original German.



These two views of the scale model give an excellent idea of the general arrangement of Rohrbach's newest air giant. The propellers are shaft-driven by four motors placed in the bottom of the hull.

the case with Rohrbach's flying boat. Practically speaking this is the only one that *can* make all kinds of engine repair while in flight.

ROHRBACH in the design of the actual boat part or hull of his great ship has followed to some extent the practice well known in ship building, that is, of using a false keel or second bottom to the hull. In this giant plane the second bottom design appears as a horizontal bulkhead, and shuts off the engine room below from the passenger compartment above, protecting the latter against fire and water, as well as from the noises of the engine. If the base of the boat of this plane should be ruptured by severe alighting or excessive wave action this double bottom would prove to be a life saver.

This plane is so designed that in case of an emergency landing far from shore and under circumstances not permitting a new flying start it could make land in record time as a marine vessel. The actual hull of the boat is about seventeen feet in width and is equipped with a very deep keel for deep sea riding. At the end of the engine room is found the first step in the hull, and from that point there is prolonged the shaft of the last engine through the wall of the boat, in such a manner as to provide the drive for a normal water screw propeller.

Owing to the slight draught of the boat and to its enormous h. p. it could develop a very high cruising speed on water. In ordinary usage in harbors for speedy docking after arrival, etc., this marine propeller would prove very convenient. The normal rudder of the plane is completed with a sea rudder.

The floor plan for the rooms of the passengers and crew are laid out in a very interesting manner. In the front of the boat is the navigating room, directly behind this is the pilot's room, and behind this is the wireless cabin. Behind this is the large passenger salon where 30 passengers can comfortably be carried. This large salon is 17 feet wide and 33 feet long. It has, as do all the other compartments, a height of about eight feet. Behind the passenger cabin there are rooms for supplies and baggage. At the rear of the boat there is a built-in electric kitchen.

Duraluminum is employed as the building material throughout the plane with the exception of certain special parts which require high test structural steel. The weight of this new giant boat ready for flight is more than 20 tons, while the useful load is fifteen tons. Its cruising range extends up to 3800 miles with a speed of between 170 and 200 miles per hour. The power will be provided either with the famous B. M. V. motors as used in the Graf Zeppelin, or by the new hot air Diesel type invented by Mr. Rohrbach himself.

## Boys Haul Glider Across Country

TWO college boys, graduates of Antioch College, Yellow Springs, Ohio, conceived the idea of buying a glider and hauling it around the country forming glider clubs and selling gliders.

The two boys, Glenn D. Argetsinger and Si Fisher, accordingly made arrangements with the WACO Aircraft Company to sell WACO gliders on a commission basis.

A trailer, in skeleton form, was made for the glider and was so arranged that the fuselage with the tail group attached could be slipped in between the two wings. A Ford front axle was used for the running gear.

The glider can be dismounted from the trailer, set up and rigged for flight in about forty-five minutes. Two tow ropes are carried, one 200 feet long and the other 400 feet. Rings and snap hooks save time in getting started flying.

Arriving in town, the outfit is left standing on the street to attract attention. A field is located and a demonstration is made, using the auto towing method. The club is organized, the order placed and then the next town is made.

## Special Flying Suit Designed for Boys

EVIDENTLY women aren't the only ones who like to dress up in attractive flying suits. Here we find a young lad all dressed up to take the air. It was quite a temptation to place the picture next to Lady Mary Heath's column.

This flying suit for boys is an exact copy of a real aviator's suit. It is made with elastic webbing at the ankles, wrists and waist so that it fits snugly, keeps out the cold and wind, and has

no loose ends or openings which might dangerously catch in whirling props.

The elastic also permits the garment to be pulled on over shoes or outergarments. It is designed so that it can be used as a practical and comfortable work suit for the boy who wants to wear an aviation suit while working in shop or out of doors.

## License Required to Repair Parachute

ANY person who packs, repairs or is charged with the inspection and maintenance of parachutes will be required to obtain a Parachute Rigger's license.

The applicant for such a license must be at least 18 years of age and in addition to passing the required examination he must have available all necessary equipment for repair work or repacking, and must show that he has packed twenty or more parachutes which have been satisfactorily jumped or drop tested.

The license will remain in effect for two years, but may be revoked or suspended upon any demonstration of incompetency. It may be renewed for an additional two years on proof that the holder has rendered service under his license for at least one-half of the term. He must also have packed at least 25 parachutes which were satisfactorily tested, either by having been dropped or jumped, during the time his license was in effect.

However, the licensed rigger will be allowed to make only minor repairs. The parachute must be sent back to the factory or one of its repair depots in the event that major repairs are needed.

# Crashing Planes for the Movies

"What to most flyers is an accident, I have done intentionally. I can crash *any* type of ship." This renowned stunt flyer reveals the science of his perilous profession.

*By*

DICK GRACE

MINE is an unusual line of work. It involves the science of aviation. It involves personal risk, judgment and money. From the very beginning it is thoroughly destructive. In the long years I have been flying it has been my pleasure to wash out over half a million dollars worth of flying equipment.

In the first place my position must be made clear. I am not and have not been since the old barnstorming days an exhibitionist. Years before the Department of Commerce placed a guiding hand on the wings of aviation I was one of the few who believed that nothing could be gained by thrilling or scaring a public.

I have never stunted passengers the first time I've had them up—and of late years refuse to stunt with them at all. I fly at safe altitudes when making a cross-country flight. Even with the best of equipment congested areas are avoided if possible. Compasses and other necessary instruments are carefully checked for night flights. Serious trouble may be the result of a slight oversight.

Aviation is safe—and I with all other transport pilots want to keep it that way. By reputation I am conservative. If I were otherwise someone else would be writing this article.

Yet why is it that wherever I go I am called upon for an exhibition? The openers of many new airports want me for stunts. Two have even asked me to crash ships. I am given good or bad ships and asked to thrill spectators. All pilots, most people, are aware of the Department rules about stunting over assemblages. Even in motion pictures it is necessary to obtain special permission to stage dog fights at low altitudes.

It has been my misfortune to witness some bad accidents caused by lack of judgment on the part of pilots. I don't intend to be included in that class of flyers who habitually try to make a crowd disperse or who stunt low with no proper place to land if anything goes wrong at an inopportune second.

A group who worked in "Young Eagles." Buddy Rogers, the star of the picture, is second from the left and is leaning on his director, William Wellman. Dick Grace is seated in the cockpit; over his shoulders is Paul Lucas, who played the German ace in the picture.

A typical "Grace-ful" crack-up performed in "The Air Circus." Grace may be seen in his cockpit, just as the wheels and wings give way in a splintering crash.

"IF SUCH is your attitude to stunt flying and to thrills how then can you excuse your intentional airplane crashes?" This question has been asked me many times.

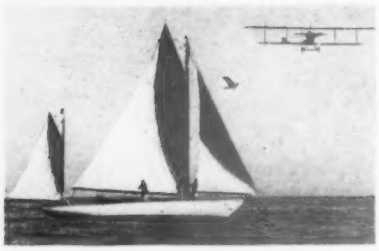
On the surface there is a contradiction of principle but a careful analysis immediately dispels any chance of disagreement. Many people forget that my work is not done publicly. It is done for motion picture companies with a specific purpose in mind. No one outside of the cameramen who photograph the thrill and myself are physically involved. Absolutely everyone else is strictly barred from the danger area. There is much preparation before, and much precaution during a crash. Numerous apparently insignificant details are crowded into a moment's time. Taken compositely they are seen in a motion picture as the greatest of thrills —the actual crash of an airplane, such as you saw in "Wings," "Lilac Time," "Young Eagles" and the many other productions.

Even Grace is not foolproof. In the filming of "Wings," he broke his neck in four places and was unconscious for two days. This picture was taken five months after the accident.

My crashes are harder than the ordinary washout with which a pilot is confronted. I am forced to hit on an exact spot, at a specified time, on certain signals and with due regard to the cameras. It is not sufficient that I am told by producers when I sign my contracts just how the ship is to lay afterward.

Some of my contracts demand that the ship shall end on its back; and others stipulate that it is *not* to end in such a position. Perhaps I am told to wash out the right wing or the fuselage or hit the nose first. I may be called upon to sideslip or to skid or dive in. It is a most exacting and strenuous bill of instructions which I receive. Sometimes I have to fly into buildings or into cliffs or to crash on the edge of a stream. There is always one little order which makes it highly difficult to satisfy.

Consider then that these are but a few of the things required of me. Now, with the advent of the sound apparatus, it is not sufficient for me to fulfill the above mentioned details but I must crash with regard to microphones. That means that the motor must have almost full throttle when I hit. It seems that I don't dare cut the switch; the roaring of the motor must be heard on the screen just before the sound of the actual crash.



After a terrific struggle on the lower wing, Dick Grace is seen being thrown overboard. Note his opponent hanging on to the struts. A second later, Grace tore his way through the sail of the boat and landed in the water.

If the scene requires a dead stick landing then I am confronted with the problem of making an absolute spot crash, with no chance to gun the motor should I overshoot. I want to ask you if you think this is easy? In the wash-out on the edge of the narrow stream in "Young Eagles" I ended so close to one camera that he couldn't get all the ship in the picture—not by a good margin. The wreckage was less than six feet from his lens and about five from the nearest microphone.

Buddy Rogers was the star of "Young Eagles" and the picture was directed by William Wellman, of "Wings" fame.

"And don't forget," were Wellman's final instructions, "It's got to end on its back—if it doesn't, we can't use it in the picture. Come in, motor on, hit the spot, and slide over on the back—much the same as the crash you did with the Spad in No-Man's-Land for 'Wings'."

Perhaps you will be interested in the details of that memorable flight.

I WAS seated in the cockpit when the director signaled that all was ready. My lap belt was in place. Chest belts were fastened and the shoulder straps buckled. I manipulated the gas and throttle with three fingers, as I would have to in a few moments. The motor was turned up and tested for the last time. Then I gave orders to remove the chucks.

Away went the old ship down the fairway. Soon the tail lifted out of the mud. We gathered speed. A few hundred feet down the slight incline I pulled the stick back and we were in the air.

Swinging over toward the troupe I saw that all of the cameramen were by their equipment. The red flag from the ground signaled that the microphones were ready to record the sound of the motor and of the crash. Then I banked away, gained a little altitude, made a quick turn.

My altimeter, placed conveniently on my left, indicated that I was a hundred and fifty feet. Now my eyes were on the row of trees. I could see the tall derrick through them, with cameramen and a few of the privileged technical staff on its top landing.

Throttling the motor slightly, I lost about fifty feet. From this height I decided to plunge in.

Nearer and nearer we came.

Few people realize just how fast eighty or ninety miles an hour is until the tops of trees are clipped. I don't think that anyone has the opportunity to measure sensation that I do.

Closer and closer was I coming. Now it was almost time to control into the spot. An accident! A catastrophe! For just a bare second my foot slipped from the loose rudder! To find the wobbly control again I had to take my eyes from the ground. Would there be time? A decision had to be made. I could not climb sufficiently to clear the obstacles ahead. I must crash! If it weren't in the spot it would be into that maze of automobiles and spectators or the tall tower. If the latter, what horrible results could only be conjectured.

A slight glance. My foot was there! Too late. I couldn't get in where I was supposed to. I banked quickly to the left. No one would dare continue in the direction in which I was headed.

Below me, some little distance ahead, was a lone cameraman. I was pocketed again.

A remarkable view taken at the moment Dick Grace crashed in a scene from "Young Eagles." The plane was traveling at 105 m.p.h. Note the flying splinters. Grace is imprisoned in his cockpit underneath the wreckage.

No time now to pause and consider a multitude of possible alternatives. No thought of saving the ship or of getting the shot. Certainly no thought of what would happen to me. I was wrong. But once again—when in an airplane under such control—if you're wrong, go ahead. Instantaneous decision is ninety per cent of being right at all times in an emergency. It is the better part of judgment. To be wrong and follow through the mistake is better than to be right too late.

With a yank I pulled the stick toward me as far as it would go. Then the rudder was kicked to the right. My throttle-hand pushed the gun full on.

It was a tailspin position. A tailspin with power but there was a cameraman down there—a man I had worked with on many pictures—Elmer Dyer. The nerviest, most daring individual who ever turned a crank. I knew he was grinding now. I knew he'd grind until I hit or hit him.

The ship almost turned on its back. Then it plunged groundward in a spin. Reaching over I cut my switch and waited.

The ground was coming up at an amazing rate. It grew in size much like a picture does that is moved toward a magnifying glass.

Crash! The motor hit and plunged through the gas tank. The wheels and the landing carriage jutted into the fuselage. Then the entire ship swung around and flew backwards for about twenty-five feet. The tail-skid, the rear of the fuselage, the rear controls broke away. There was an angry snarling of ship and motor parts, as though the old boat was giving vent in its last moments to an ungovernable rage. It was still. It was all over.

Elmer Dyer rushed to the side of the cockpit. His eyes were bright as he looked at me seriously.

"Thanks, Dick, for saving my life," he said.

"Pretty close," I countered.

"You bet, but wait until you see the shot I got!" he said, a faint smile breaking over his tanned face. And I believed him, for he sure was close enough.

WHAT to most flyers is an accident, I have done intentionally, and I believe I speak with authority when I say I can crash *any* type of ship. It can be an old war-time Spad or Fokker D7, or it may be a new production job. I can crash it completely and be able to walk out.

Of course I'd like the benefits of a few of the precautions I observe when crashes are done intentionally, if I were to accidentally be forced down, but I've proven to my own satisfaction that even redressing a ship for a crash is unnecessary. Five out of the last six ships I have used were current stock models of modern types. There was no rebuilding. All of these crack-ups were with power on—all were difficult. One of them was completely stripped of its wings, another hit in so much of a dive that the tires were not blown nor the landing carriage injured, though I landed upside down. On the third I crashed in a flat spin.

Taking into consideration the preparations that are necessary for a crash, we have to start with the pilot. In the first place a highly keyed, unimaginative person should have no thought of succeeding in this line of work. A fear of self produces a disquietude of mind which reacts on the nervous system. It causes a loss of sleep and produces a high muscular tension. No one in such physical shape is capable of cool calculation. When driving a ship into the dirt you cannot duck. With the speed necessary it is most important that everything be seen, or the spot may be missed and several cameramen messed.

Many times I've had people ask me, "Don't you have a few drinks before doing such a thing?" My answer to this is that if I ever had any stimulant before doing a crash I am pretty sure I wouldn't be here now. If I ever need a drink to bolster my nerve I'd better

quit. Then I'd be sure that I had lost my intestinal fortitude.

I knew one flier who attempted this thing and he drank a half pint of liquor before. When his nerve had been bolstered enough he did his crash, but whether the price of liquor was too high or for other reasons he never dared repeat his performance.

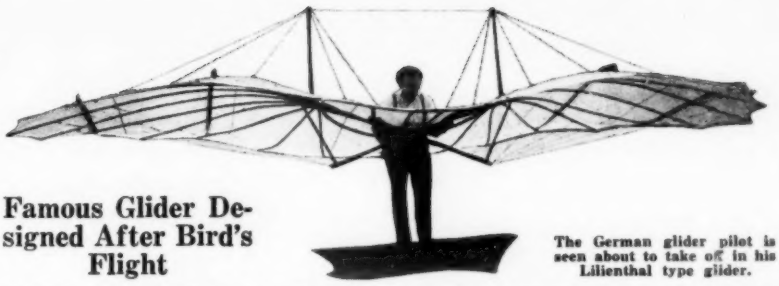
Moreover if an unscheduled event happened and it was found that there was a trace of alcohol in the body of the aviator, what reaction? All the blame would be shouldered by that pilot. The Department of Commerce specifically calls upon pilots to obey its rules. It is to be noted that an immediate suspension or revocation of license will accompany any drinking and flying. I intend to obey the rules, not only because of the valuation I place on my license but also because I like to live.

FEW people realize that I have a complete physical examination before and after all of my crashes. My eyes, ears, lungs and blood pressure are tested. Even my heartbeats are counted. So far there has not been a variation of one beat in the two examinations.

In the final outcome of a washout, food plays an important part to the pilot. Consultation with medical authorities has convinced me that eighteen hours previous to the jolt no solid matter should be taken. Therefore I eat no dinner the night before and no breakfast the next morning. I am limited to a pint of hot milk before retiring and two glasses of orange juice eight hours later. There is no lowering of vitality due to such abstinence. As a matter of fact the mind is keener than it would be if the stomach were filled with heavy, useless food. It goes without saying that with a lean stomach there is very little chance of internal injury, for parts affected by an extreme blow can squeeze completely together; otherwise they would probably rupture. Moreover, were an operation necessary it would involve less danger of complications by following a lean diet.

Precautions for the ship vary according to the effect desired and the speed necessary. Crashing of an airplane successfully is nothing more or less than finding a way for the dissipation of forces. If I come in at 95 m. p. h. and 1400 revs. there must be *some* way of diverting that force to the motor and the ship, *before* it is transferred directly to the fuselage and to me. Perhaps a wing strikes first and absorbs a certain amount of shock. Then the propeller and radiator hit. When the motor plunges into the firewall and gas tank there is but a fraction of the initial force transferred to the pit and to me.

One of the most important items of a successful crash is the ground crew which coördinates with me. The riggers and mechanics, after the ship is fitted for the crash, are transferred to the rescue *(Concluded on Page 50)*



The German glider pilot is seen about to take off in his Lilienthal type glider.

## Famous Glider Designed After Bird's Flight

OTTO LILIENTHAL is called the father of the modern glider. In fact, the airplane is the lineal descendant of the ill-fated motor-glider which caused the death of Lilienthal.

This famous German designer admired the efficiency of the bird in flight. His aim was to develop a mechanical wing, with supporting and propelling properties. It was Lilienthal whose efforts aroused considerable interest in the flying machine with flapping wings.

In this picture we see Hans Richter, a present-day German glider-pilot displaying his glider, a duplicate of the original Otto Lilienthal type. Pilot Richter has secured a license permitting him to fly the machine.

## The Thrilling Sport of Bursting Balloons

THEY have a novel and thrilling way of entertaining the Sunday crowds out at T. C. Ryan Airport, San Diego, California.

It is the sport of balloon bursting, with an airplane used as the weapon of attack. Two-foot gas balloons are released at the wing-tip signal of the pilot. Time is counted from the release of the first balloon until the fourth one has been burst by each pilot.

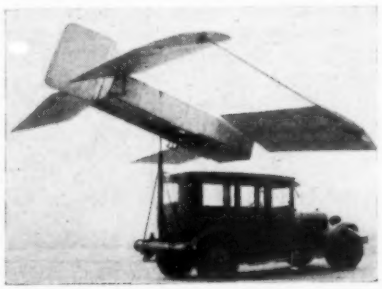
Due to the peculiar wind conditions created by the air as it rushes by the wings and fuselage of the ship, it is hard to burst the balloon unless a direct hit is made by the propeller. A miss of few inches means that the pilot must zoom and reverse his course (most thrilling to the watching crowd) or the balloon will be out of bounds before he can regain sufficient elevation to make another attack.

Flight Instructor Paul Wilcox, and John Fornasero, chief of maintenance at Ryan Field, put their Great Lakes sport trainers through some wonderful maneuvers to keep in line with the balloons which the prevailing wind insisted on carrying dangerously close to electric light and trolley wires.

How those pilots could see the small balloons or how they could dive and zoom and rush at them was a wonder to the crowd. It was the fast and skillful work of Paul Wilcox that brought him victory with his time at seven and a half minutes, John Fornasero taking one minute longer.

## Trick Machine Acts Like Airplane

HERE is a new device for getting a thrill and learning how to control a plane. As the auto moves along, the pilot seated in his cockpit trails the movements by means of a rudder bar. The plane weighs 150 lbs. and is mounted at the top of an extension rod above the auto. When the auto moves the air pressure on the plane's surfaces causes it to rise or fall about two feet,



simulating a climb or dive if the controls are properly operated.

The front wings act as ailerons, the rear ones as elevators. The faster the air travels the more sensitive the controls; the slower, the more sluggish. A good pilot can keep his plane in perfect flying altitude as he follows the maneuvers of the auto with his controls. A pupil or a passenger is given a taste of flying sensations that will accustom him to a plane, without actually leaving the ground.

## "Southern Cross" Uses Cotton Propellers

THE three propellers which drew Major Kingsford-Smith and his crew over the Atlantic Ocean were made of cotton! The airplane propeller blades are made from ordinary canvas compressed into a non-corrosive product of metallic strength.

The process of the manufacture of these propellers is a secret one but it is commonly known that the basis of it is canvas, layers of which are impregnated with certain chemical components and pressed into a substance of steel-like hardness.

These propellers when bronze or brass tipped have been found especially adaptable for seaplanes because of their capacity to resist water spray.

## THIS PLANE WON SECOND PLACE IN DERBY

### Prize $7000; Average Speed, 127 m. p. h.

ROBERT L. Hall, Chief Engineer for the manufacturers of the Gee Bee plane, has sent us photographs and a description of their latest model.

The Gee Bee Sportster was one of the winners in the recent $25,000 All-America Air Derby conducted by the Cirrus Engine Company. This ship has a span of 25 feet and is powered with an inverted super-charged Cirrus. The motor develops 110 h. p. at 2100 r. p. m.

The high speed is 146 m. p. h., the landing speed is 49 m. p. h. Mr. Hall advises us that the list price on this particular racing model is $4980.

The ship is fitted with a special gas system for inverted flying which automatically feeds gasoline to the carburetor when upside down.

The wings are braced directly to the landing gear which is rigid, the 20x9 Airwheels providing shock absorption. Baggage space sufficient for tools and large brief case is provided under the turtle deck.

The stabilizer is rigidly braced to the fuselage and fin by four wires, a Bungee control providing longitudinal balance adjustment.

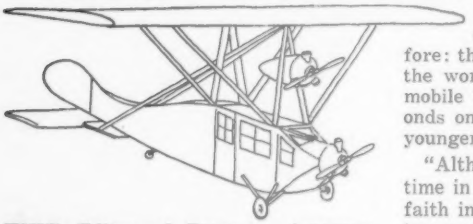
## Navy Planes to Have New Features

APPLICATION of the Curtiss Tanager features to the fighting planes of the United States military establishment is indicated by a contract given the Curtiss Airplane & Motor Company by the Navy to equip two F8C-4 two-seater carrier fighters with floating ailerons, slots and flaps similar to those on the plane which won the Guggenheim International Safe Aircraft Competition.

In this modification of the latest fighting plane designed for shipboard work on the Navy aircraft carriers, the safety features will be operated exactly as they were on the Tanager. The flaps will be mechanically operated by the pilot and the slots will be automatic, with a device for locking them closed if desired. The floating ailerons will be placed as a continuation of the lower wings of the biplane.

Rather than safety, which is always a secondary feature on military aircraft, the purpose of the changes will be to provide a very considerable decrease in landing speed and increased control at landing speed. Both of these features have considerable importance for deck landings at sea. Production is going forward at present on these two planes in the Garden City plant.

## Wonderful Performance Claimed for Unusual Design



THE Editor of POPULAR AVIATION was very pleased to receive the following letter from Freeman A. Brooks, who writes as follows from his home in New Hampshire:

"Because I am a constant reader and hoping other readers and yourself also would be interested I have enclosed a drawing of the new safety plane designed by Ruric W. Jordan of West Thornton, N. H.

"Mr. Jordan has invented and done a few wonderful things before: the Jordan auto rim, and he holds the world's record for changing automobile tires—four tires in twelve seconds on a racing car in Florida in his younger days.

"Although he is having a difficult time in finding a backer he has all the faith in the world in his plane. He has two motors, as you see, and a very high wing.

"He claims that from 10,000 feet one can glide 50 miles easily, land at 8-10 miles an hour, land or take off in a ball diamond (50 ft.), can stay suspended in air with both motors off and that it is as easy to drive as an auto.

"I hope you may find this interesting, for who knows this may be the start of a new type of plane."

## Endurance Motor Still Good

IMMEDIATELY after the Hunter Brothers' endurance flight in their "City of Chicago," a Stinson monoplane powered with a stock Wright Whirlwind 300, was completed, service men checked over the engine and found everything in good condition.

With no adjustments other than a new oil strainer, and a supply of fresh oil, the engine started off at the first turn, accelerated normally, and turned up the same r. p. m. as before the endurance flight.

The engine was then shipped to the Wright factory, at Paterson, New Jersey, where it was tested with full flying equipment, and in spite of the gruelling test of 553 hours continuous operation, this engine produced 314-horsepower at 200 r. p. m., with the normal fuel consumption. This is within the requirements of a new engine.

No adjustments whatever were made, not a spark plug nor a magneto was touched, nor were any rocker box covers removed. This engine met the requirements of a new engine after running twice as long as engines are operated under the most severe service before complete overhaul.

## Teaching the Young to Fly

A TRIP from Los Angeles, California on a T. A. T. plane has made a "flying fan" out of three-year old Betty Lou Hasselburg of Indianapolis. The little girl stood at the field after she landed and regretfully watched the plane as it took off again, following it with her eyes until it was lost in the distance.

"Want to fly again" was the young lady's stoical comment when asked if she enjoyed her trip. She and her mother made the trip together and Mrs. Hasselburg said that Betty Lou was delighted with the sky-lark mode of travel and if it had not been that her daddy was waiting at Stout field where she landed would have insisted on continuing with the plane.

XUM

# How to Build the Rhön Ranger

## Part III. The Concluding Installment

THIS is the last of a series of three articles on building the Rhon Ranger. In the previous ones, complete instructions were given on building the ribs and assembling the wing and fuselage.

We are now ready to finish up the job. There is nothing left to do except assemble the tail group and of course to rig and cover the glider. There is also the matter of adjusting the controls and pilot's seat.

Before giving the final instructions, let us run over briefly the parts and materials needed to finish the job.

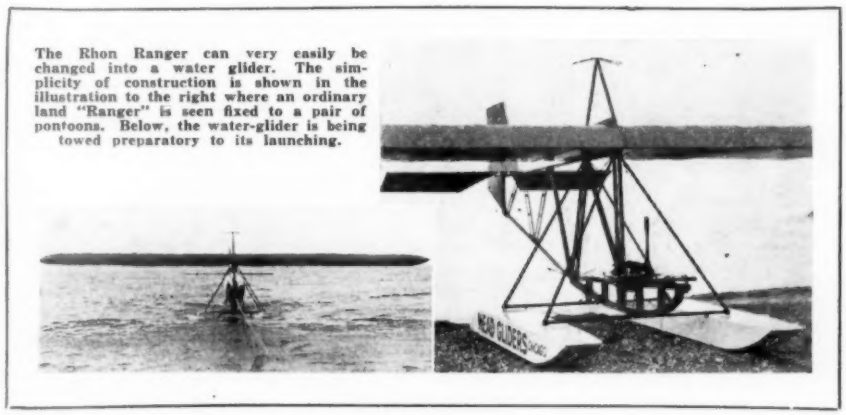
*Controls and Seat, Wood Material*

Part No.

F1 1 pc. hardwood 3/4"x3/4"1'3" (control stick)
F2 1 pc. hardwood 1"x1"x2'6" or 1 pc. 20 ga. steel tubing 2'0" long (torque beam)
F3 1 pc. hardwood 5/8"x1 1/8"x2" (rear bearing)
F4 1 pc. hardwood 3/8"x3/4"x1 1/8" (front bearing)
F5 3 pcs. spruce 3/8" x 4" x 1'2" (seat proper)
F6 1 pc. spruce 3/8"x1"x 4'0" (seat cleat strips)
F7 1 pc. spruce 3/8" x 2" x 3'2" (seat braces)
F8 1 pc. hardwood ¾"x2"x1'3" (rudder bar)

*Control and Seat Hardware*

G1 32 3/4" No. 6 FH wood screws (seat and supports)
G2 16 1" finishing nails (diagonal braces)
G3 1 pc. sheet steel 2"x4" 16 gauge (rudder bar anchorage)
G4 1 pc. sheet steel 2"x5" 20 gauge (pulley bracket)
G5 1 pc. strip steel 3/4"x1'6" 16 ga. (front bearing strap wire pull on stick, and aileron wire pull)
G6 1 pc. strip steel 1"x10" 16 ga. (stick side plates)
G7 1 pc. sheet steel 2"x12" 16 ga. (torque beam side plates)
G8 1 pc. sheet steel 4"x5" 18 ga. (aileron walking-beam)
G9 1 pc. strip steel 5/8"x9'0" 18 ga. (rudder bar wire pulls and six turnbuckles)
G10 1 aluminum pulley
G11 1 5/16"x1 3/4" bolt with 2 nuts (rudder bar pivot)
G12 2 5/16" flat washers for same
G13 23 3/16"x1 3/4" bolts for fittings listed above
G14 12 extra 3/16" nuts for turnbuckles
G15 14 3/16"x3/4" bolts (control wire connections on stick, rudder bar, aileron walking beam and tail group)
G16 2 1/8"x1" iron rivets (control stick plate)
G17 1 1/4"x1 1/2" S.A.E. bolt and nut (stick pivot)
G18 3 ft. 1/8" flexible control cable (elevator cable over pulley)
G19 2 1/8" galv. thimbles for G18
G20 115 ft. No. 14 plated hard wire (control wires)
G21 16 No. 14 spiral wound ferrules for G20



The Rhon Ranger can very easily be changed into a water glider. The simplicity of construction is shown in the illustration to the right where an ordinary land "Ranger" is seen fixed to a pair of pontoons. Below, the water-glider is being towed preparatory to its launching.

G22 1 pc. sheet steel 2 1/2"x6" 20 ga. (aileron walking beam gauge)
G23 4 3/8" RH screws for G22

*Miscellaneous Materials*

K1 5 ft. web strap (hinges for control surfaces)
K2 1/2 lb. No. 2 tacks (for tacking fabric to wings, etc.)
K3 1 ball rib bracing cord
K4 50 yds. 36" wide cotton fabric
K5 100 yds. 1 1/4" pinked tape
K6 5 gallons clear nitrate dope
J12 126 ft. No. 14 plated hard wire (internal wing bracing)
J13 12 No. 14 spiral wound ferrules
J14 100 ft. No 10 plated hard wire (flying and landing wires)
J15 20 No. 10 spiral wound ferrules

*Tail Unit, Wood Material*

D1 75 ft. random lengths 3/16"x1/2" spruce (capstrips, etc.)
D2 30 ft. random lengths 3/16"x3/4" spruce (sides)
D3 3 pcs. spruce 1/4"x3/4"x3' (trailing edges)
D4 2 pcs. spruce 5/8"x5/8"x4'8" (stabilizer leading edge)
D5 1 pc. spruce 5/8"x5/8"x6" (filler at stab. ldg. edge splice)
D6 1 pc. spruce 5/8"x5/8"x3'4" (leading edge of vertical fin)
D7 3 pcs. spruce 3/4"x3/4"x4'0" (rudder and elevator spars)
D8 1 pc. spruce 3/4"x3/4"x8'4" (stabilizer spar)
D9 1 pc. spruce 3/4"x3/4"x2'8" (vertical fin spar)
D10 1 pc. spruce 3/4"x3/4"x1'6" (filler blocks at horns)

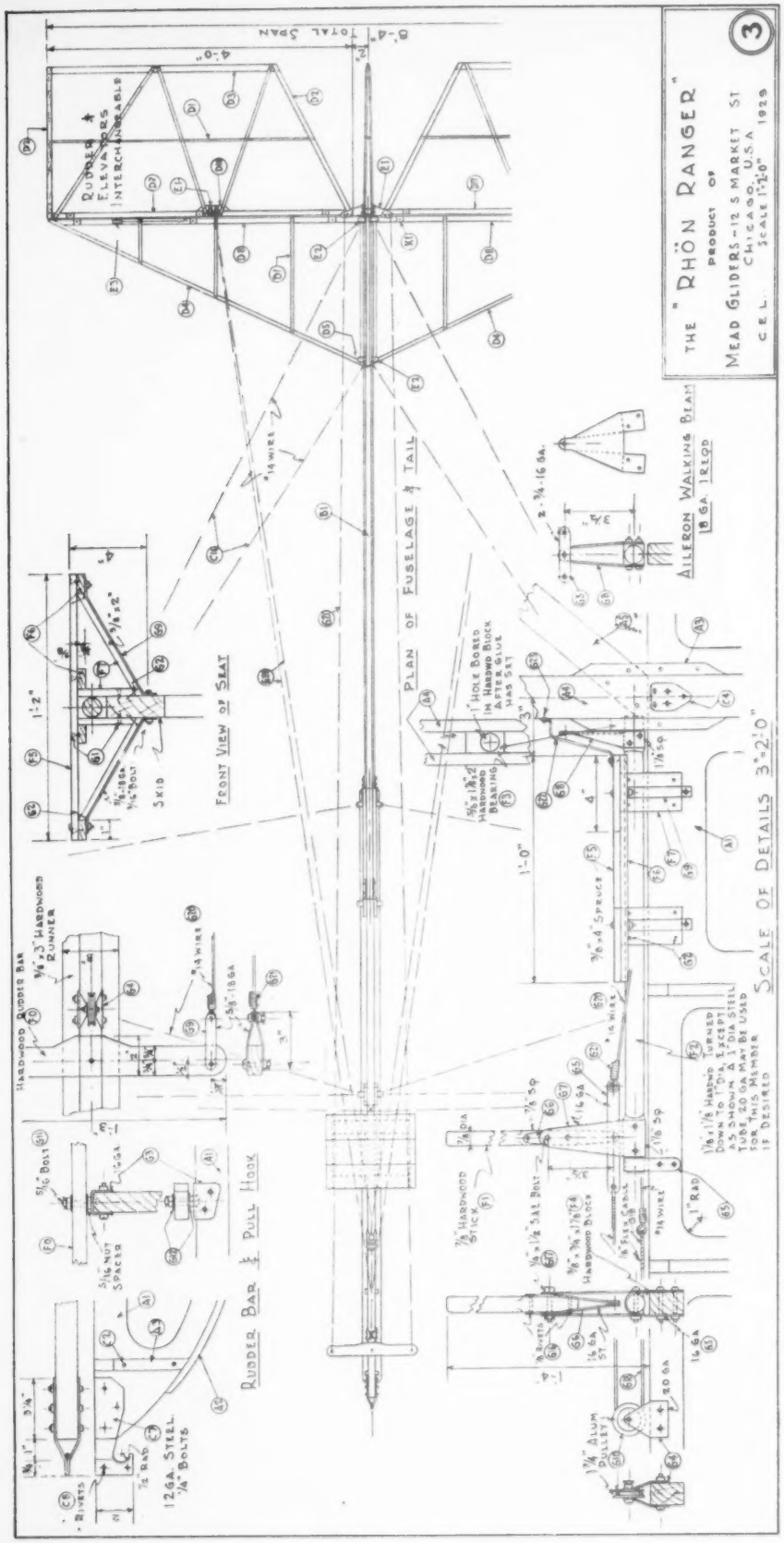
*Tail Unit, Hardware*

E1 1 pc. sheet steel 2"x4'0" 18 gauge (horns)
E2 1 pc. strip steel 3/4"x12" 16 ga. (stabilizer brackets)
E3 1 pc. strip steel 5/8"x1'4" 18 ga. (stabilizer bracewire pulley)
E4 28 1/8"x1 1/2" bolts (horns and hinges)
E5 9 3/16" x 1 3/4" bolts (stabilizer & fin brackets and brace wire terminals)
E6 1 dozen 1 1/2" finishing nails
E7 1/8" lb. 5/8" No. 20 wire nails
E8 16 ft. No. 14 plated hard wire (stabilizer brace wires)
E9 8 No. 14 spiral wound ferrules for E8

*Instructions for Assembling the Tail Group*

STABILIZER: Lay stabilizer spar (D-8) on the bench and cut to length; it helps to drive a few small nails beside it to hold it in place. From the center of the spar measure out 24" at right angles to spar, and set a nail here to mark the apex of the triangle (23" to be the outside dimension).

Lay the right leading-edge (D-4) of stabilizer from the end of the spar to the apex marker, mark the cut required to mitre the leading edge where it meets the spar end, and make this cut. Place in position again and mark the mitre cut for the apex. Cut off, and proceed in the same manner for the left lead-




ing edge (D-4). Cut a small piece from the filler block (D-5) to fit into the apex of the triangle and reinforce the joint. (A "deadstop" is almost indispensable in the construction of the glider, as there are many occasions when small nails must be driven where there is no solid support under the wood. A sledge-hammer head or some block of iron with a smooth surface makes a good deadstop).

Put glue on all joints and nail them together with 1" No. 20 nails (J-25). It is a good idea to fit blocks in all three angles, gluing them in place and nailing through the leading edge into the spar.

When the triangle is completed, mark off the positions for the cross-pieces (D-1) and nail them in place with 5/8" No. 20 nails (E-7) after spreading glue on the joints. Also make spacer-blocks from scraps and nail them between the cross-pieces at the center of the span. They should hold the cross-pieces 3/4" apart.

Round off the outer edges of the stabilizer with a coarse file or rasp. Before the glue sets, drill a 1/16" hole about 1/2" into the leading edge where they meet the spar, and strengthen the joint with a 3/4" No. 6 screw (G-1) at the two rear corners.

The vertical fin is practically a repetition of the stabilizer, and no additional instructions will be needed.

The same general procedure is followed with the rudder and elevators, the only suggestion we make being that you take a small piece of the 1/4"x2" basswood (H-18) and glue it between the cross-pieces where they meet the fiiller blocks for the horns. This will make a flush surface so that the fabric will not be depressed when you bolt the horns to the spars.

In making the angle-brackets which attach the stabilizer to the fuselage and vertical fin, hold the stabilizer in its proper position with the back of the spar flush with the back of the stern-post, then make the front brackets so that the bolt passes through the center of the top longeron, and the two vertical bolts through the filler block at the apex of the stabilizer. It may be necessary to put a block in the front angle of the fin also so that the bolt will pass through solid wood.

The stabilizer spar should be bolted to the lower fitting before the top bracket is made,

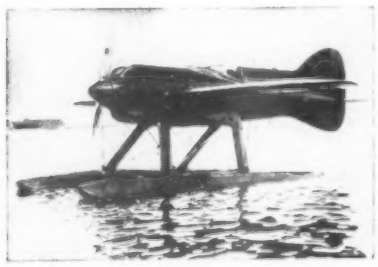
*(Continued on Page 54)*

## A Brief Review of the Schneider Trophy Races

ON October 26, 1925, a large crowd was witnessing the Schneider Trophy Contest at Bay Shore Park, Baltimore. Men, women and children watched breathlessly as the flimsy racing planes hurtled around the course. Everyone was filled with admiration for the dare-devil pilots roaring by overhead. Then their admiration turned to pride as the American Curtiss Racer streaked across the finish line first. The United States had won the Schneider Trophy Race! It had been victorious in one of the greatest speed contests ever held! In aviation circles throughout the country this triumph was recognized as a sign of America's strength in the air.

One year later a large crowd was again watching the Schneider Trophy Contest. Once again a racing plane flashed across the finish line, but this time it was not an American plane. Italy had won the race. The American crowds were silent, disappointed.

Soon America became disinterested in the Schneider Trophy Contest. The public was indifferent. As a result no team was sent to Italy for the 1927 races. Lt. Williams made a gallant attempt to enter the race and regain the trophy for the United States, but unfortunately his effort aroused little interest on the part of the public. When the 1929 races came around, Lt. Williams tried again to participate, but he was pursued by hard luck from the very start and failed to have his plane ready in time. Again his endeavor attracted surprisingly little attention.



Lt. Al Williams' ill-fated Mercury racer of 1929.

If someone were to ask the reason for this indifference, he would probably be told that participation in the race is a useless waste of money. But is it a useless waste of money? Let us go over the facts and see.

In America today there are very few planes that can go much faster than 200 miles an hour, whereas in England the Schneider Trophy Contest has produced a plane capable of over 350 miles an hour. In America there is no airplane engine, excepting the Packard "X" type, that has a rated horse-power of more than about 800. Only two of the Packard engines have been built and their rated power is 1500. In England an engine was built for the Schneider Trophy Contest which is capable of developing, when pushed to the utmost, nearly 2000 h. p. Italy also has made amazing progress by taking part in the Schneider Trophy Contest. An Italian racing plane has gone over 300 m. p. h., powered by an engine which developed 1750 h. p.

These figures show what a great forward step has been taken in aviation and aircraft development, due to the Schneider Trophy Race. But even if it is admitted that this contest is a great benefit to aviation, some people still contend that participation in it incurs more money than it is worth.

England is said to have spent five million dollars on the 1929 Trophy Race. They built two Supermarine Rolls-Royces, two Gloster Napiers, and reconditioned one of the 1927 racers to use as a reserve plane. Little wonder that they spent so much money. Italy, too, built a fleet of planes. Six were shipped to England for the races, but only three were actually flown. That is why such large amounts of money are used in the contest. But why is it necessary to build four or five planes? Why isn't one enough? Squadron-Leader Orlebar's Supermarine would probably have gone 357 m. p. h. just the same, if all the other planes had never been built. Imagine how much the expenses could be cut down by building only one plane. The race could easily be put on a profitable basis.

## This Ship Placed Fourth in Cirrus Derby

THE Ogden Osprey is a six-place, trimotor cabin monoplane of the high wing type, powered with three American Cirrus engines.

Motors are completely cowled in, reducing drag and enhancing the beauty of the ship. The method of cooling employed is efficent at all times. A simple and fool-proof system, utilizing only the rudder pedals and a hand lever, controls the brakes either together or separately.

Among the high points of the Osprey are: No propeller overlap, chairs secured directly to fuselage, wide landing gear, first trimotor in this country to use three air-cooled, in-line engines.

This ship has a span of 50 feet, and a useful load of 1650 lbs. It will cruise at 102 m. p. h., land at 50 m. p. h., and has a top speed of 130 m. p. h.

## Traveler's Aid Kit

THE two things most likely to bother the air traveler, especially on his first trip aloft, are noise and nausea or "air sickness."

Each passenger on most of the air lines is handed a neat glassine envelope which contains the small packet of absorbent cotton for plugging the ears, and four Wrigley P-K's. Among the great transport companies to which these "Air Travelers' Packets" are furnished are the Pan-American, Boeing, Maddox, T. A. T., Davis and Western Air Express.

The packet is imprinted with the name of the line using it, and this announcement, "This packet contains Bauer & Black absorbent cotton for plugging the ears, and Wrigley's Chewing Gum for your convenience and comfort."

## The Jacques Schneider Maritime Trophy

| Year | Place | Winner | Pilot | Machine | Engine | H. P. | Aver. Speed |
|---|---|---|---|---|---|---|---|
| 1913 | Monaco | France | M. Prevost | Deperdussin | 160 | Gnome | 45.75 |
| 1914 | Monaco | England | C H. Pixton | Sopwith | 100 | Gnome | 86.8 |
| 1920 | Venice | Italy | Luigi Bologna | Savoia | 550 | Ansaldo | 107 |
| 1921 | Venice | Italy | G. DeBriganti | Macchi VII. | 200 | Fraschini | 111 |
| 1922 | Naples | England | H. C. Biard | Supermarine | 450 | Napier | 145.7 |
| 1923 | Cowes | U.S.A. | Lt. D. Rittenhouse | Curtiss | 465 | Curtiss | 177.38 |
| 1925 | Baltimore | U.S.A. | Lt. J. Doolittle | Curtiss | 600 | Curtiss | 232.57 |
| 1926 | Norfolk, Va. | Italy | Maj. DeBernardi | Macchi | 850 | Fiat | 248 |
| 1927 | Venice | England | Flt. Lt. Webster | Supermarine | | Napier | 281.68 |
| 1929 | Isle of Wight | England | F. Off. Waghorn | Supermarine | | Rolls-Royce | 328.63 |
| 1931 | England | | | | | | |

Right, the Grant Navy Flying Boat. Below, The Dragon Fly.

Below, Zeppelin Scouting Plane.

Left, Zeppelin Dornier Whale. Below, Gotha type Grant Zeppelin.

# Believe It or Not---These Are Zeppelins !

COUNT Ferdinand von Zeppelin is known the world over as the father of rigid airships—inventor of the air giants that today bear his name. But he is not usually thought of as a builder of heavier-than-air machines. Nevertheless, he constructed far more airplanes than airships, and is regarded as the originator of the practical all-metal airplane and flying boat.

It was not until 1917, about five years after Zeppelin first began to improve heavier-than-air machines, that the first duralumin plane took the air. It was known as the Zeppelin two-seater, and was completely designed and built by the Zeppelin organization —a true Zeppelin, even though basically different from the huge airships that invariably are called by that name.

The Zeppelin two-seater plane was designed for military scouting purposes, and was built in 1917. It had the distinction of being the first practical duralumin airplane. Only the wings were fabric-covered. The motor was a 240-horsepower Maybach, giving it a speed of 100 miles per hour. The plane's dead weight was 3,080 lbs. This machine showed the influence of its airship ancestors. An examination of the front wing construction would reveal that girders used were of distinctly Zeppelin airship type. For the rear wing spars, another Zeppelin construction element was employed—a box girder with circular perforations.

During the World War various Allied centers were unwilling hosts to giant visitors from Germany, huge biplanes that carried bombs and machine guns. "Gothas" they were called, being the Gotha type of Grant Zeppelin Biplane. These great planes were products of Count Zeppelin and his workers. Materials used were steel and wood, with fabric covering. Power was provided by four Maybach motors of 240-horsepower each. Two of the engines were mounted between the wings, while the other two were in the fuselage, geared to a single propeller at the nose. The ship was armed with machine guns and bombs, and its weight, including the guns, was 13,200 lbs.

Much has been heard since the war of the "Whale" type of flying boat. Dornier Super Whales are to be operated in this country in passenger service. The ancestor of these ships was the Grant Navy flying boat, built in 1918 by the Zeppelin organization. It was the largest airplane constructed during the war period, and for several years after. The ship was a monoplane, and was equipped with four 260-horsepower Maybach motors, arranged in pairs working in tandem, each driving its own propeller—not unlike those on the giant Dornier-X flying boat launched last year. In addition to duralumin, high grade steel channels were used extensively in construction. These huge flying boats made some remarkable flights from Friedrichshafen to Bremenhaven, delivering supplies. In 1919, a modified type of the boat was built and later developed into the present Whale type. Although primarily designed as a military craft, it is now establishing an enviable record as a commercial transport plane.

Besides building the largest flying boat, the Zeppelin organization constructed the smallest one ever manufactured. This was the Dragon Fly, completed in 1921. Its wing spread was 28 ft. But the wings could be folded, reducing the width to 10½ ft., small enough for storing in a garage or motorboat shed. The boat weighed 858 lbs. empty. It had a 70-horsepower Siemens motor, and could carry two passengers at a speed of 80 miles per hour—and it got "twenty miles to the gallon!"

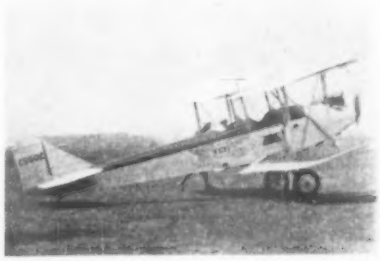
Among the larger flying boats that have hung up records is the Zeppelin Dornier Whale. It is a monoplane of 75 ft. wing span. It has a dead weight of 7600 lbs., and the useful load is 6160 lbs. It attains a speed of 120 to 125 miles per hour. Two 400-horsepower engines in tandem, each driving its own propeller, one a tractor and the other a pusher, constitute the power plant. Amundsen used two of these Dornier Whales on his North Pole flight. Major Franco flew another from Spain to Brazil.

## Dawn Motor Performs Unusual Vibration Test

MISS BOBBIE TROUT, twice holder of the world's altitude record for women, is seen giving her Dawn motor the unusual "egg test," which she has devised for detecting vibration. Although the spark plug wires from one cylinder are disconnected, the egg does not jiggle, due to the reciprocating action of the new motor. The spoon which holds the egg is clamped to the motor.

Miss Trout is shown pointing to the egg on the spoon. The egg remains in place despite the fact that the engine is running only on four cylinders.

## Fly-Yourself Company Actually in Operation



THERE has been a lot of talk about different fly-yourself companies planned or going to be organized.

There is actually such a company operating planes in Chicago at the present time. It is the Bowers Fly Ur-Self Company.

The above picture shows one of their planes ready to take off. A Commandaire can be rented with a pilot, whereas the Whittelsey Avian (illustrated) is being rented for solo flying. Both services are offered by this concern and are proving very popular.

When a new customer desires to do any solo flying, he merely presents his government license, even if no more than a student's license, and then takes a check ride with one of the company pilots in order to show that he knows how to fly.

# The Cruise of the Mugwump

**If you are looking for excitement, try joy-hopping in a fourth-hand crate**

*By* DOC SCHNURMACHER

WHEN you're romping across country in a sturdy plane that has been well cared for, it's a ten to one shot that you don't need to takes a chute along. But when you take to flying with a chap who is so darn crazy to fly that he'll invest in any sort of an old crate that can totter around on its club-footed wheels, well, that is something else again.

Take Bobby for example:

A mechanic was warming up a small, weather-beaten plane under Bobby's careful supervision, as I drove over the short bumpy road leading into Curtiss Field and parked the car in front of the American Eagle Hangars near a few hundred others whose occupants were watching the planes that delightful Saturday morning.

Bobby had purchased a brand new fourth-hand plane, appropriately enough christened the Mugwump. He had invited me out to fly with him and shoot some pictures from the air, and, in a weak moment I had consented.

As I walked over to where the aged Mugwump was stuttering nervously, I looked over the field and saw that there were some forty or fifty planes in the air, landing or taking off so casually that my first squeamish feelings about the old crate were somewhat abated.

Standing in front of a nearby hangar was the most magnificent pair of cavalry boots I had ever seen. They were walking nervously back and forth and as my eyes traveled upward I saw protruding from them a resplendent pair of bedford cord breeches encasing the limbs of a little chap whom I mistook for Mr. Curtiss Field.

"Golly," I murmured in awe to Bobby, "I'll bet that's an ace!"

"Nope, that's merely the prominent son of a local millionaire," said Bobby, and introduced me. It was Roger Wolfe Kahn, son of Otto Kahn.

"Going up today?" I asked politely.

"No!" answered the vision abruptly, "both planes laid up!"

**The long line of cars looked like toys as we flew over them and banked.**

**"But," he added thoughtfully, "people who buy fourth hand planes for $700 should make sure that their carburetors are on tight."**

"What a shame," I sympathized, but the cavalry boots were already off on their walk back and forth.

"Don't mistake him for a pilot," said Bobby, "his old man owns an opry house or something, and that costume is designed to elevate flying. He's just studying. The real flyers are those grimy looking ones in overalls."

"What's his planes worth?" I asked curiously.

"Oh, several thousand dollars."

"And what did you pay for yours?"

"Seven hundred dollars, and that Mugwump is a buy!"

That should have warned me. I can understand that price for a plane that's worth about twice that new, but when it's worth nearly six times that price new! Anyway I climbed into the front cockpit. Bobby "gave her the gun" and we taxied across the field to take off.

THE long line of cars looked like toys as we flew over them and banked. At a thousand feet, the Jericho Turnpike resembled a spotted snake with its line of cars, and the ground was a swell pattern of dark contrasting patches.

Higher still—the altimeter now registered three thousand feet as we head cross-country towards the Harlem River and the bridges which I could already see. We were going to pick out the Boston Post Road and I intended to shoot some airviews of pretty Pelham.

We were well over the Harlem River and about twenty-five minutes out when the motor sputtered. The radiator cap, which until then had been on the distant horizon, dipped earthward. I looked at Bobby and he waved his hand reassuringly.

The motor picked up again, then sputtered and coughed. I felt little chills running up and down my spine and mentally reviewed my insurance policies, wondering if I had fallen behind in any payments. Then with a panicky feeling, I pounded on the back cowl to attract Bobby's attention.

"Carburetor trouble," he yelled.

"Where do you keep your parachutes?" I yelled back.

"Haven't any, they're three hundred dollars apiece," and he continued in an almost normal voice as the noise of the engine stopped, "we're all right, don't touch anything and ride, don't walk, to the nearest exit!"

Then Bobby became very busy. As the plane glided earthward he looked around for a landing spot. I squinted over the side. The earth was coming up too darn fast to suit me, but it all looked pretty level except further south where the closely clustered buildings of the Bronx squatted.

I SAT nervously hooking and unhooking my safety belt and wondered aimlessly where we would crack up . . . not nervously but just morbidly curious. Bobby pointed to a strip of land bordered by a creek and a couple of gas tanks near a bridge behind us on the Post Road.

"South Pelham," said Bobby, "'at's where we're gonna land."

"And how!" I added.

At five hundred feet, Bobby zoomed, banked and headed south. The ground passed rapidly before me as we turned. Then Bobby did himself proud. He came down on all three points and there was only a small thump when wheels and tailskid touched the ground of the small level patch that paralleled the road. I let out one yowl of joy and waved my arms at the passing cars as the Mugwump sped forward.

Suddenly there was a terrific lurch and I was pulled forward against the safety belt as the Mugwump's nose buried itself in some thick marshy grass at the edge of the field. As I unbuckled my belt, Bobby slid over the side and went up to the engine.

"The carburetor fell off! The carburetor fell off!" he chanted mournfully to the gathering crowd.

"Mine, too!" I corroborated weakly. Gosh but the ground felt good even if it was marshy.

"Run over and phone the Field to send over a whole squad of mechanics while I hold the crowd back," ordered Bobby.

When I returned, some time later, the plane looked greatly the worse for wear, with many little tears and holes in the wing fabric. Bobby stood with a monkey wrench in his hand and a puffing policeman was chasing off the last souvenir hunter who was triumphantly waving aloft a large piece of fabric as he ran.

"You'd think they never saw a plane before," said Bobby bitterly, "one guy even tried to cut a piece out of my flying coat."

"Listen, Lindbergh," I said in my best reportorial manner after calming him, "is there anything that you would like the waiting press to tell your adoring public?"

"No, don't mention my name," said Bobby, "the old man would raise cain if he knew I cracked up the ship on its very first trip."

"But," he added thoughtfully, "you can write an article stressing the fact that people who buy fourth-hand planes for $700 should make sure that their carburetors are on tight."

I promised faithfully that I would . . . . . and this is it!

# Let the Wind Be Your Ground Crew

**Here is a radical way to launch your glider. It sounds impossible, but the author offers mathematical proof of its feasibility.**

*A suggestion by* JOHN B. RATHBUN

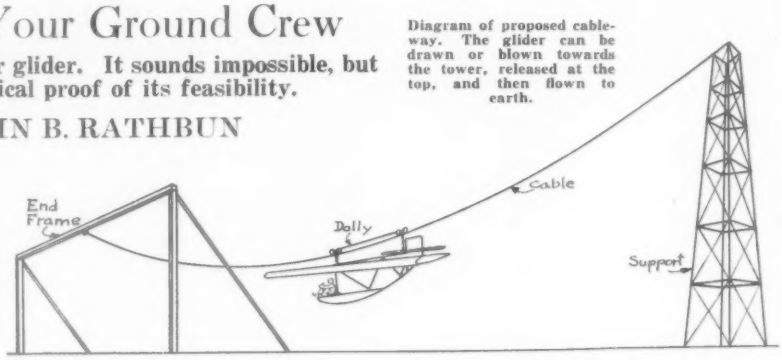



Diagram of proposed cableway. The glider can be drawn or blown towards the tower, released at the top, and then flown to earth.

OUR cover design illustrates still another means of launching a glider that is at once simple and positive. In short, this consists of sliding the glider down a long inclined cable against the wind until the gliding speed is attained, whereupon the glider is released and continues its flight in air under normal conditions. In short, we have created an artificial hill that is particularly applicable to flat country by stretching a cable between two points.

Our artist has indicated a balloon as a support for the high point of the incline, perhaps rather fanciful in view of the cost of balloons, but this is not the principal point in view. The cable can be supported at its uppermost end by a tree, by a cliff, hung from a building, a tower or what have you, and the final results will be just the same. There are a great many ways of attacking this problem, but as our prime idea is to devise a one-man launching device we will bear this idea in view in our solutions. In the first place, the glider must be pulled up to the high point on the cable by power or by the effort of the pilot. Secondly, the glider must slide down along the cableway to gain the necessary speed for gliding. Thirdly, the glider must be released at the proper moment by a trigger or catch controlled by the pilot. This is the story in a nutshell.

For the promotion of the one-man idea in launching, it is proposed that the glider be blown back along the cableway by the wind to the highest point. With a breeze of from eight to fifteen miles per hour, this will not require much surface, and affords a simple means of "coasting uphill." One method would be to provide a sail surface on the carriage or dolly. Another would be to provide wing-tip ailerons that could be turned up at an angle of 90 degrees as shown, or to provide rear edge ailerons that could be pulled down low on each wing tip at the same time. All of these schemes are perfectly feasible and the details are easily workeed out.

With a breeze of fifteen miles per hour, pressure of about 0.75 pound can be had for each square foot of vertical surface presented against the wind so that it is a simple proposition to calculate the number of square feet required for pushing the glider along the cableway. In addition to the surface added by the wing tip ailerons shown we have the vertical surface presented by the glider itself, the body of the pilot and an additional sail surface that can be added to the dolly.

When at the top of the cableway, the ailerons can be turned down flush with the wings, or in normal flying position, and then the head resistance will be so reduced that the glider will automatically move forward against the wind ready for the takeoff. It is estimated that a total of about 30 pounds wind pressure will be required for forcing the ship up the cableway if the maximum slope of the latter is not more than fifteen to one, and this amount of surface is quite easily obtained. From 40 to 50 square feet of vertical surface will be sufficient in most cases to do the work at fifteen miles per hour, or less surface at higher wind velocities.

At the forward end of the runway, a gallows frame should be erected for carrying the low end of the cable, the posts of this frame being spread far enough apart to clear the wing tips by a comfortable margin. At the rear or higher end, any sort of tower can be erected for the purpose, a wood tower being easily made from common timbers. The cable should be a flexible or "hoisting" type steel cable of a standard type, always avoiding the stiff rigging or stay type. The dolly is simply a two wheel carriage provided with grooved wheels held in a wood frame. The remainder of the details easily suggest themselves to the average builder who is more or less controlled by the nature of the materials available.

THE amount of vertical surface required for running the glider up along the cableway can easily be computed from a standard formula. In working out this equation, the coefficient (K) for a flat plate is taken at 0.0033, the area is taken as one square foot while the velocity (V) is assumed at 15 miles per hour. Then we have:

$$\text{Pressure Per Square Foot} = KxAxV^2 = 0.0033x1x\ (15x15) = 0.74$$

Thus the pressure per square foot at this velocity is about three-quarters of a pound per square foot. If a force of 30 pounds is required for towing the glider up the cableway, then we have a total of: 4/3x30=40 square feet of vertical surface. With two wing tips 4'x6' we have 48 square feet alone provided by the ailerons, to which we can add about three square feet for the machine and pilot, or a total of 51 square feet. With this amount of surface we can reasonably expect 38 pounds towing force.

## Is a Greased Wing Faster?

GREASING the wings and body of an airplane, so that it will slip through the air more easily, is far from being a new idea. On the contrary, it has been proposed frequently during the past twenty years in a number of different guises. To the average layman, greasing the wings seems a very logical proceeding, but a study of the facts in the matter will soon show that the lubrication of the surfaces has an inappreciable effect upon the performance of the machine.

Air waves and eddies cause the greatest part of the resistance and power loss, fully 90 per cent of the opposition to flight being chargeable to setting the air into useless motion. The extent of the eddies is very little affected by the nature or condition of the solid surfaces passing through the air, but is principally controlled by the shape of the bodies or wings and their nearness to streamline form. Proper streamlining, so that the body will pass through the air with a minimum of disturbance, is the principal object at present.

About five per cent of the total resistance is due to the adherence of the air to the surfaces, and the dragging of the adhering film after the ship. This is the so-called "skin resistance," due to the nature of the skin, and is therefore the only resistance affected by oiling or wetting the surfaces. The use of oil or any similar viscous fluid, reduces the air adherence and the skin friction by about one-fifth so that the total effect of surface lubrication is one per cent or less. This effect is therefore insignificant and not worth while worrying about, at least until the more serious eddy losses are disposed of.

## Junkers Uses Four Wheels

THE landing gear of the Junkers G-38, the world's largest land plane, is unique. The weight of the huge aircraft is between 20 and 24 tons with full load, too great to be borne by two wheels. Therefore the airplane has a landing chassis of four wheels, and for the first time airbrakes are used on an aircraft. The pneumatic pressure actuating the brakes may be applied on all four wheels at once with the same force, or it may be applied to any individual wheel with varying force. The machine weighs 13 tons empty, but can be controlled with one hand.

## Observation Car Lowered from Dirigible

OBSERVATION CAR
FOR
SUB-CLOUD EXPERIMENT
THESE TESTS WERE CONDUCTED BY THE "MATERIEL DIVISION" OF WRIGHT FIELD, DAYTON, OHIO
WINDLASS TO LOWER CAR THRU CLOUDS
CABLE SUSPENDED FROM WINDLASS
WHILE THE DIRIGIBLE IS HIDDEN ABOVE THE CLOUDS, OBSERVER TAKES OBSERVATIONS FOR MILITARY MANEUVERS OR LANDINGS IN A FOG
TELEPHONE WIRES BY WHICH COMMUNICATION IS MAINTAINED WITH AIRSHIP'S PILOT
PHONE HEAD-SET
THIS END ACTS AS A RUDDER OVERCOMING REVOLVING TENDENCY AS CAR IS LOWERED

RECENTLY the Materiel Division, Wright Field, Dayton, Ohio, experimented with an observation car suspended from a dirigible in flight. It was purposely designed to allow the dirigible to remain above the clouds, with the observer directing flights or taking observations for maneuvers, suspended below the clouds. It is planned to develop this device not only for bombing operations during warfare, but also for assisting in the landing of dirigibles in fogs during commercial activities or peace-time maneuvers.

The observation car is suspended below the dirigible by windlass and cable which supports also the "phone" cord for communication with the dirigible's crew. The ordinary type "phone" system employed on the captive balloons is used. The headset is attached at all times on the obesrver's head and he makes his reports direct to the pilot of the dirigible. A signal of mechanical nature is also attached for emergency uses. The lowering of the observation car caused it to revolve in the tests, but was controlled by giving the car a rudder effect on the rear for retarding this tendency.

## New Spray Gun Developed for Airplane Dope

A NEW spray gun for the application of airplane "dope" by the spray method is announced by The DeVilbiss Company of Toledo, Ohio. This new gun has been on test for the past 6 months in some of the leading airplane plants.

Its operating principle is entirely different from that of any other spray gun now being used with airplane dope or any other viscous material. The chief difference between this and other spray guns is that it is provided with a hollow needle around which the fluid leaves the nozzle of the gun in cylindrical form with air pressure within the cylinder to aid in the atomization of such heavy bodied and viscous material as airplane dope.

# *How To* BECOME A

*By*

LIEUT. CHARLES E. CHAPEL, U. S. M. C.

Here we see a group of new students who have just arrived for their elimination flight training. We wonder if they all will be so gay when the tests are over.

WILL the Navy or Marine Corps teach me to fly? There is a fair opportunity in both Navy and Marine Corps for alert air-minded young men, but the path is not an easy one.

Both branches of service offer two avenues leading to the designation of "Naval Aviator." You can either enlist in the regular service for a full period of four years, or you can enlist in the Naval Reserve, with the privilege of being discharged if you fail to pass the examinations. Both courses have their possibilities.

Let us assume that you decide to take your chance as an enlisted man of the Marine Corps. Your first step is to communicate with the nearest recruiting station. If there is none in your city, the postmaster can probably tell you where to apply; if he doesn't know, the quickest procedure is to write a letter to: Marine Corps Recruiting Bureau, 1100 South Broad Street, Philadelphia, Pennsylvania, telling that office that you are interested in marine aviation. Within a few days you will receive a letter answering any particular questions you may have asked, advising you where to present yourself for enlistment, and enclosing a little booklet entitled: *"Aviation Training in the U. S. Marine Corps."*

In some cases a special recruiting party may visit your home town, thus saving you any expense; otherwise you must pay your own travel expenses to the nearest recruiting station. As recruiters are scattered throughout the United States the cost is negligible; after acceptance your transportation will be paid for by the government.

The age for enlistment is between eighteen and thirty-five years; those under the age of twenty-one must have their parents' written consent. The applicant must be physically above the average for American manhood; waivers are only granted for minor physical defects. Immediately upon acceptance you will be sent either to the Recruit Depot at San Diego, California, or to the Recruit Depot at Parris Island, South Carolina. There you will be given three months' intensive military and physical training, and upon completion of your recruit training you will be allowed to submit an application for aviation duty.

IN CONSIDERING applications for aviation duty, Marine Corps officers define the ideal applicant as one who "has had mechanical training, has had experience with gas engines and is a mechanic by trade, has had a high school education and is amenable to military discipline." This is the "ideal" consideration, but there are still hopes for those who do not measure up to this standard. A *"good* recruit for aviation" is defined as one who "has had previous mechanical experience and ability, but this is not essential. He should have a good education, a desire for aviation duty (important) and intelligence."

Before a marine can apply for actual flight training he must have completed two years (including recruit training) in the Marine Corps Aviation Branch. If he requests flight training and such request is approved he must agree to extend his enlistment two additional years, making a total of six years he must serve before receiving a discharge. However, if he fails to make the grade as an aviator this extension of enlistment is canceled and he is given his discharge at the end of the regular period of four years.

As an enlisted man, you are eligible to apply in writing to the Major General Commandant of the Marine Corps for training at the Naval Air Station, Pensacola, Florida. When such request is received at Headquarters, Marine Corps, in Washington, D. C., your record is examined to see if you have completed the necessary two years with an aviation unit, if your educational qualifications are satisfactory, and if you have performed your duties in a satisfactory manner during your enlistment up to this point.

If everything is satisfactory so far, your commanding officer is asked to comment on your apparent ability to complete the flight course. If he gives you his approval you will be given a flight physical examination which is

A class of Naval aviators at work in the gas engine laboratory. Those failing to win their wings are eligible for training and advancement as mechanics.

# NAVAL AVIATOR

Do you want a flying career with the Navy? With the Marine Corps? Lt. Chapel tells you exactly how to apply, and what opportunities await you.

designed to weed out those who would endanger themselves and others if allowed actual control of aircraft. In addition to this special flight physical examination, you will be given a psychological examination to see if you have any peculiar mental kinks that might lead you into a crash. Especial attention is paid to the applicant's equilibrium, his eyes, and his ears. If he is over twenty-eight years of age his chance of being sent to Pensacola is practically nil; experience has shown that military and naval aviators must be caught and trained early if they are to be of value to the government.

THE classes at Pensacola start on the first of each month; the course lasts from eight to ten months. This year the quota for enlisted men of the Marine Corps is thirty-five men, of which thirty will probably successfully complete the course and graduate as "Aviation Pilots." The instruction received by these men is about the same as that given to the officers, so it is readily seen that educational requirements are high, that a high school education or its equivalent is essential for a marine who hopes to win his wings.

Having won his wings, the Enlisted Aviation Pilot is given his flight orders, which entitle him to a fifty per cent increase of his base pay. "What happens if he fails to receive his wings?" is frequently asked. In the event that he is not sent to Pensacola, or is sent there and fails, he is still eligible for training and advancement as a mechanic; fully twenty per cent of the entire personnel of Marine Corps Aviation have flight orders as mechanics, radio operators, photographers, or aerologists.

The aviation branch at present has an authorized enlisted strength of 1100 men distributed as to rank as follows: 4 sergeants major, 10 quartermaster sergeants, 23 master technical sergeants, 13 first sergeants, 82 gunnery sergeants, 24 staff sergeants, 78 sergeants, 205 corporals, 20 field musics, and 640 privates and privates first class.

The rate of pay for enlisted grades is as follows: Private, $21.00 per month; private first class, $30.00 per month; corporal, $42.00 per month; sergeant, $54.00 per month; staff sergeant, $72.00 per month; gunnery sergeant, $84.00 per month; first sergeant, $84.00 per month; quartermaster sergeant, $126.00 per month; sergeant major, $126.00 per month; master technical sergeant, $126.00 per month.

WOULD you like to undergo training in either the Naval Reserve or the Marine Corps Reserve Aviation courses? Here again the going is rocky. If you are lucky you can receive a thorough and complete training in both land and seaplanes, at government expense, and be able to return home in about two years time with a Reserve Corps commission and the valuable flight training that goes with it.

The first step is to write the Marine Corps Recruiting Bureau, 1100 South Broad Street, Philadelphia, or the Naval Recruiting Station, or the Bureau of Navigation, Washington, D. C., stating your desire in obtaining aviation training in the Reserve Corps.

It must be borne in mind that all this is quite different from a regular enlistment and should never be confused with same. The Reserve Corps opportunities are far greater but the requirements are of course infinitely more stringent.

Let us assume that you choose the Marine Corps as your aviation teacher. It is required that you be a male citizen of the United States or any of its island possessions, that you be not less than eighteen years of age when you first enlist in the Reserve, and not more than twenty-seven years and four months when you are detailed for flight training at Pensacola, Florida. You must be mentally, morally, physically, and psychologically qualified for enlistment and for aviation training. You must agree to remain on active duty for one year after being commissioned as a Second Lieutenant, U. S. Marine Corps, or for a total period of twenty-one months; and you must agree to maintain flying efficiency in so far as is practicable by associating yourself with a Marine Corps Reserve Aviation unit after completing training.

Furthermore, you must submit three letters of recommendation signed by persons of recognized standing in your home community, such as priests, ministers, rabbis, judges, lawyers, doctors, teachers, and business men.

THESE are only the general requirements. The educational requirements declare that to be eligible you must be in one of the following classes:

(a) Graduates of Naval Reserve

Radio is an important part of the training of every Service flyer. Here is a class at the Radio School, Hampton Roads Naval Training Station.

**A group of Naval students receiving their instruction on aerial machine guns.**

Officers' Training Corps units who are certified by the Bureau of Navigation, Navy Department, as eligible for a commission in the Naval Reserve, and who are recommended for Naval Reserve Aviation Flight Training by the Professor of Naval Science and Tactics of the units concerned.

(b) Graduates of universities and and colleges who have satisfactorily completed the course in the Naval Reserve Aviation conducted by the Department of Naval Science and Tactics attached to such institutions, and who are recommended for Naval Reserve Aviation flight training by the Profes- of Naval Science and Tactics.

(c) Engineering graduates of universities and colleges who have satisfactorily completed an Aviation Ground School Course approved by the Bureau of Navigation. Such graduates are required to present a certificate of graduation, or a diploma from those institutions, together with a certificate showing satisfactory completion of an approved Ground School Course.

(d) Graduates of universities and and colleges who present the following documents:

1. Certificate of graduation or diploma.
2. Certificate signed by the Registrar showing that they possess a mathematical education which as a minimum shall cover the complete treatise as set forth in Robinson's *"New Higher Arithmetic,"* Wentworth's *"College Algebra,"* Wentworth's *"Plane and Solid Geometry,"* Plane Trigonometry as set forth in Wentworth's *"New Plane and Spherical Trigonometry,"* and Milliken and Gale's *"Practical Physics,"* or in other similar recognized standard textbooks of equivalent scope.

(e) Candidates who are unable to qualify under any of the above classes, but whose training is substantially equivalent, may be considered. If selected their applications should be substantiated by documentary evidence.

If you can establish your qualifications according to these requirements your application for flight training may be approved, or you may be ordered before a board of three officers for personal interview and examination. If you still pass satisfactorily you are permitted to enlist at a Marine Corps Recruiting Station as a private of the Marine Corps Reserve, immediately promoted to private first class, Marine Corps Reserve, and ordered to active duty at Seattle, Washington; Great Lakes, Illinois; Boston, Mass.; Rockaway, Long Island, New York, or Pensacola, Florida.

You will receive a thirty days' flight elimination course, which carries you through dual instruction and checks for solo flying. Failure to qualify for solo training causes you to be ordered to your home, placed on inactive status, and discharged from the Reserve at your own request. If you successfully pass this preliminary training, however, you will be ordered immediately to the Naval Air Station, Pensacola, Florida, for further training.

The next phase of your training, as a "Leatherneck" aviator, is an eight months' course covering two hundred actual hours in the air, embracing the same instruction as given to regular officers. If you fail in this second phase the same procedure is followed as if

**A flight student is about to receive his instruction at Hampton Roads, Va.**

you failed in the preliminary training. Those students who pass this phase successfully are examined for a commission as Second Lieutenant, Marine Corps Reserve, and if found qualified, are ordered to active duty with regular Marine Corps squadrons, where the third phase of their training is given.

The final phase of Marine Corps Reserve training is active duty with the rank, pay, privileges, and allowances of a Second Lieutenant, Marine Corps Reserve, with regular Marine Corps operating squadrons, where officers receive military indoctrination and advanced *(Continued on Page 51)*

## THE THRILLING RESCUE OF THE SHIPWRECKED ARMY FLYERS

### From the official report of Lt. M. A. Schur, U. S. N.

ON a Wednesday morning, two Navy airplanes from Squadron Four departed from the Naval Air Station to guard a flight of army airplanes proceeding to the Island of Hawaii.

Instructions were that, should an army airplane be forced down, we were to land immediately and rescue the army flyers.

When near Upolu Point a message was sent from our sister ship stating that they would turn and head for home. About this time a message was intercepted by my radio operator advising that an army amphibian had gone into a nose dive and that two men had jumped with parachutes.

I immediately dove down close to the water and sighted two army bombers circling about fifty feet over the water. I also noticed two army amphibians which had already landed. A short distance from these two planes there was a large slick caused by oil on the water and a small amount of wreckage floating nearby.

I piloted my plane circling around near and down wind from the wreckage, directing my men to keep a sharp look-out for men floating in the water. Suddenly one man was seen waving his hand. I throttled down my engines and yelled to my crew to hang on as I knew it would be quite difficult to land in the heavy sea as the seas were running high and the wind had increased in velocity.

An excellent landing was made but great difficulty was experienced in the handling of my plane in the water, using full throttle at times to swing my plane out of the wind and sea to get near the men in the water. But as it was necessary to get to the men as soon as possible I did not hesitate to give her full throttle.

I taxied the plane so that the bow was alongside the man and my crew had a hold on him and cut both engines, and we hauled a Lieutenant Boyd into the plane.

Then we looked and listened and finally spotted a second person floating about 100 yards ahead and to the right of the spot where Lieutenant Boyd was rescued. Both engines were immediately started and again it was necessary to use almost full throttle to head cross wind and seas to the position of the second person. The wings of the plane at times were totally submerged in the seas and the plane was taking an awful beating but we had no time to spare.

Finally arriving to the second person, my crew in the bow grabbed him, but a heavy sea pulled him loose.

This was partly due to the fact that this man was almost unconscious and still had the parachute secured to his body. So it was necessary to again start the engines and taxi up to him as the plane had speedily drifted downwind with the engines stopped.

Just before I was able to get my engines started Dobson, my radio operator, who was standing on the starboard side of the bow, looked at me, and I knew what he wanted to do, so I yelled at him and told him to hang on. However, he either slipped or jumped, the plane drifting rapidly away from him. Dobson yelled "Get me" and by this time our engines were started and we speedily rescued him and then went ahead to the second army man and, this time, I had all four of my crew in the bow to grab him.

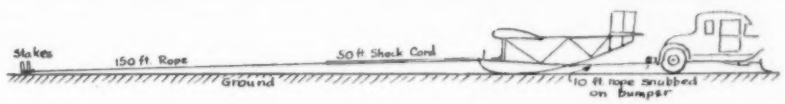
Due to my crew all being in the bow the green sea washed right over us and it was a great effort to hold on, but we managed to get the bow alongside the man and grabbed him, hooking the harness of his parachute over the securing cleat on the left side of the bow of my plane.

I then cut my engines and we all helped haul this man on board. Getting him on the bow of the plane, we stripped him of his clothes, life belt and parachute. It was necessary to administer first aid to him as he had quite a quantity of salt water in him and, while rolling him on his stomach, the water poured out of him.

Believing that we had everyone we were about to relax for a moment when an ungodly yell was heard off the port bow about 200 yards. In the maneuvering of the plane to rescue the third man, the wing spars of my left lower wing bent upward in the center of the wing. Time was most precious and as the last man we had gotten had been almost gone when we pulled him aboard, we would have to reach this third man promptly if we were not to lose him. We wasted no time, bent spars or not, and turned the plane down and cross wind and sea to a spot to the leeward of him. Then with practically one-half throttle, headed upwind and the high seas to this man, who proved to be Cowan.

He certainly was exhausted and almost gone for even after hauling him into the plane a shark at least fifteen feet long made a lunge at him, narrowly missing members of my crew in the attempt to reach Cowan. We likewise moved him back into the tail compartment of my plane, secured all the water-tight doors, rendering first aid to the rescued and I then taxied around searching for the fourth member of the crew. However, being assured by Lieutenant Boyd that their fourth member had gone down with the ship, I gave it up as useless to search further.

## A Different Way to Launch Your Glider




JOHN A. LEAVITT is a flying instructor at the Jamaica Sea Airport. He is also an ardent reader of POPULAR AVIATION, and submits a suggestion which will be of interest to glider owners looking for new methods of launching. The suggestion is somewhat similar to the sling-shot idea presented in last month's issue.

"It was with great interest that I read my first copy of POPULAR AVIATION today," writes Mr. Leavitt. "It certainly seems to fill a long-felt need for a publication devoted to light airplanes, gliders and models. Count me in as a lifelong reader.

"I believe that what is retarding the growth of glider activities in this country is a safe and practical means of launching a glider which does not require a large ground crew. Several months ago I was faced with the problem of giving instruction with the aid of but two men and worked out the following method which has proved to be the safest and most practical method yet devised:

"A large flat area of ground is selected. As near the center as possible two stakes about five feet long are driven, so that about a foot and a half of the stakes are left above the ground. To these two stakes are attached about 150 ft. of strong rope, and attached to the rope is a 5/8-in. shock cord about 100 ft. long. This is doubled in order to give a more concentrated strength. A ring is provided at the end of the shock cord for the glider. The customary hold-back rope of about ten feet which is fastened to the rear fuselage is snubbed around the bumper of an automobile.

"The car then runs ahead until the shock cord is taut. The car is stopped and the brakes put on. The pilot takes his place in the seat, one man holds the wing steady. At the command 'cast off' the man holding the rope lets go and the glider takes the air. Some of the advantages of this system are:

"1. The student is not bothered by having anyone in front of him.

"2. It is possible to control the length of flights very accurately by marking where the front wheel of the car stops. If a longer flight is desired the car is run up a little further, or for a shorter flight it is not run up so far. This is invaluable in teaching students.

"3. The entire system requires but two men and a pilot, and is to my belief the easiest method of launching. There is small danger of the pilot hitting the stakes with the whole field to land in. The glider may be placed so that it is facing the wind at all times providing the stakes are in the middle of the field."

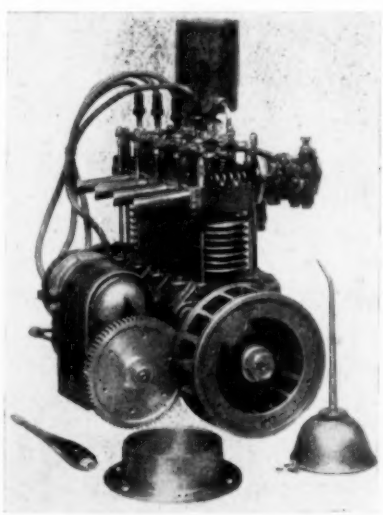
## Small Four-Cylinder Motor Designed for Gliders

A NEW light motor has recently been developed by the Cramp Mfg. Co. that may solve the problem of adding power to your glider.

Up until the present time it has been difficult to find a motor that was not too big, or not too heavy, or one that wouldn't shake a glider to pieces from its vibration.

The little motor pictured above is a four-cylinder, air-cooled in-line motor designed with overhead valves. It has a 1 3/8-in. bore by 2-in. stroke. It will develop around 10 h. p. Spark is supplied by a magneto. This little motor measures only 12 in. in height, 12 in. in length and is 12 in. wide. It weighs but 62 pounds.

With such specifications this motor should be very well adapted for use in gliders. Because of its smallness, it could be installed on the conventional glider with few changes to the glider. The fact that it has four cylinders instead of two or three cylinders, should be a great advantage in that vibration is considerably reduced.



Some idea of the size of this new motor can be gained by comparison with the standard size magneto with which it is equipped

## New Parachute Can Be Attached in Two Seconds

The airman below, with chute attached, is ready to bail out. The inset shows the pilot in a stripped fuselage, wearing only his harness. In an emergency he grabs his "pack" and hooks it on the fitting at the center of his harness.

THE Quick-Attachable Parachute made by the Triangle Parachute Co. is the answer to a widespread demand for a parachute that would serve the requirements of flyers who move about in the plane in carrying out their work—such as gunners, photographers and observers on lighter-than-air-craft who cannot conveniently wear a chute at all times.

This new parachute development is also ideal for use by those who, because of cramped cabins or inadequate seat room, cannot comfortably wear a parachute. To such individuals it offers a new standard of safety.

Note the Triangle "Monkey-Tail" Belt and front of harness for the Quick-Attachable Pack. The flyer wears the harness and carries out his various duties. When emergency arises, he seizes the chute which is attached to the frame of the cockpit or cabin, attaches the pack to the harness by simply inserting the fitting on the pack into the lock on the harness and gives the pack a quarter turn. The entire operation takes less than two seconds! The mechanism is so designed that the flyer can see it lock, hear it lock and feel it lock.

## New Airplane Looks Like Flying Eagle

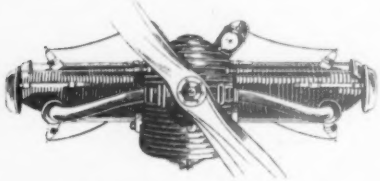
CONSTRUCTION of a new type airplane, resembling the wings of an eagle, has been started in Los Angeles, Calif., and is shown here by Wayland Avery. The company claims a study of the flight of the eagle has disclosed new principles of aerodynamics which will give such a wing a lower landing speed, greater lifting power, use a smaller motor power and easier takeoffs.

## Two-Cylinder Engine Will Power Glider

THE Glideoplane Company has secured from Germany a new type of Glider motor which it has redesigned and will put into production.

Its engineers have made such changes as are necessary for American Aircraft practice, as well as increasing its power to twelve h. p. at 1800 r. p. m. It will be a two-cylinder opposed four-cycle with dual magneto and supercharger. The motor will be equipped with a 46" propeller.

Patterns and dies are now being made to convert this motor into a real glider power plant. It is proposed to put this motor into a combination soar-



power glider so constructed that it can be used either as soaring or power glider.

The soarer will have a fifty-foot wing spread using the N. A. C. A. 81 J. airfoil which is internal braced cantilever wing. The length of the ship will be 23 feet over all with a tail surface equal to 64 square feet and 30 square feet of aileron surface. It will be all-metal construction, fabric covered, equipped with Goodyear air wheel.

## Reader Describes a Successful Helicopter

DEAR Editor: I beg leave to draw your attention to the subject entitled, "Why Helicopters Have a Tendency to Topple Over," on page 51 of the June issue of POPULAR AVIATION.

For a large number of years I have been experimenting upon various devices to lift a body vertically from the ground. Naturally I first tried the horizontal propeller, and I experienced the same as you publish. Therefore, I set about to find out the reason why.

This is the result that I came to: that the propeller acts as a gyroscope, which when hung in a horizontal position will describe a parabola varying from 30° to 45°. To try this, get a bicycle wheel and hang it from one end of the spindle and turn the wheel around at a high speed and you will get the same effect.

My first experiment was with a single propeller, and this tilted the machine very bady. Then I tried two propellers, running in opposite directions, but without any success. The propellers were not in tandem but separate units. My idea was to create a negative air pressure above, and a positive pressure below, in order to make the air pressure lift the machine and not the propeller, the propeller supplying the necessary air pressure. I was successful in this, but I could not keep the machine upright. This was in 1909 when they were trying to fly across the English Channel.

I have still kept up my experiments but not with the Helicopter, and I have made a small model that will go up in a vertical plane and will go either backward or forward or remain stationary over any fixed point, and no doubt that with varying propeller speeds it may be able to go sideways. This may seem almost an impossibility, but it is an actual fact.

Should you know of any person or persons interested in this, I should be very pleased to get into communication with them.

Thanking you, in anticipation, I remain, Yours faithfully,

(Signed) J. Kennedy.

[*We knew the readers of* POPULAR AVIATION *wanted further particulars and photographs on Mr. Kennedy's model and we wrote to him requesting the additional information. The following letter was our answer.—Ed.*]

DEAR EDITOR: At the present time I do not think that it would be advisable to publish the photograph and particulars of this design. Owing to its simplicity, almost anybody could make it up and as it is not patented, I would immediately lose all the benefits that may be derived. You are at liberty to publish the statements that I have made.

I may also state that at the present time there is no model in existence for I have broken it up, but could easily make another one for I still have the material.

Trusting that you will be in position to publish this, thanking you in anticipation, I remain, Yours faithfully,

(Signed) J. Kennedy.

"Hello, Clovis, this is A-4." D. W. Tomlinson, vice president of T. A. T.-Maddux, tries out the new radio transmitter.

# "A-4 CALLING CLOVIS..."

## It is now possible for a pilot in the air to carry on a radio-telephone conversation with ground stations. This article describes the apparatus over which the conversation takes place.

*By* D. R. LANE

THE big metal monoplane bucked and bounced as it slid over the turbulent air currents at the crest of the Manzano mountains and headed downward toward Clovis and the end of the day's run. Ahead were the comfort and warmth of the T. A. T.-Maddux lines' lounging rooms, sleeping cars for the night's run east to Waynoka, the relaxation that comes after a long day's flying. Ahead, too, were flurries of snow, a darkening sky and a nasty headwind.

It grew darker and the snow grew thicker. Visibility was poor and getting worse. The pilot took up his radiophone.

"Hello, Clovis. This is A-4, just over the mountains. How's it look ahead?"

"Not so good," came back the answer instantly. "It's plenty thick between us and you and there's a regular blizzard on here."

"I'm going back," announced the pilot.

"I wouldn't do that," broke in a new voice, that of the operator on duty at Albuquerque, a station where the plane's passengers had had dinner an hour before. "It's blowing great guns here and the top of the mountains is all smeared up. Better set down somewhere."

"O. K.," answered the pilot. "I'm going to turn back and set down at the first good field. Get that, Clovis? Check me in to headquarters, will you?"

"O. K.," came the voice of the Clovis operator, through a hundred or more miles of wintry night. "You're going to set down and wait for it to clear."

"That's right."

The plane came around in a gentle bank. Inside the lighted cabin the passengers were reading, gazing idly out the windows at the blackness beyond, two were playing cards. They did not know the plane was turning.

The pilot took up his radiophone again.

"Hello, Clovis. I'm over Moriarity and going to set down."

"O. K. A-4. You're setting down at Moriarity."

Around and down went the plane. A third time the pilot talked to Clovis.

"I'm setting down now; reeling in my antenna."

In three minutes the ship was on the ground and the courier was explaining to the passengers that they hadn't arrived in Clovis but were at Moriarity and would wait out the storm before proceeding. Meanwhile pilot and pilot mate were unreeling the antenna and setting it upon a bamboo pole and insulators which they took from the tail of the plane. In two minutes more the pilot was talking again to Clovis.

"We're on the ground. . . . . Yes, a good landing; the field's all right and the passengers are all right. We'll wait here for it to clear. Call me if you want me."

And that was all there was to an incident which, under other circumstances, might have caused alarm in a dozen quarters, worry over a "lost ship," daredevil searches through a storm to locate the "missing" plane and so forth, all after the manner already familiar to the public through numerous newspaper stories. But none of that happened.

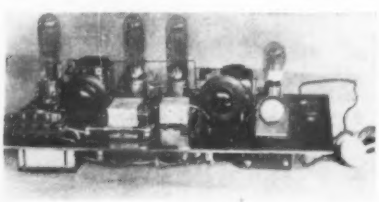
THE reason was that the plane, like all other T. A. T.-Maddux aircraft, operated over the transcontinental route, was equipped with a new and efficient radiotelephone transmission apparatus developed by the line itself. This apparatus replaces equipment of a much heavier, more cumbersome and more complicated sort originally provided for the planes by a radio manufacturer.

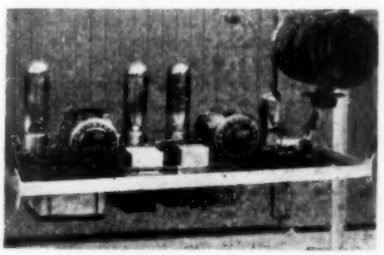
As the new equipment was constructed under rush orders, and with every possible means taken to save time and get it on the planes as quickly as possible, considerable use was made of parts of the old apparatus, which were rebuilt, rewound or changed to suit the new requirements. Yet the new set weighs only 85 pounds against 160 for the former equipment and has marked advantages of simplicity. A further reduction in weight will be attained when the present dynamotor source of current supply is succeeded by engine-driven generators, such as have been thoroughly tried out by the Byrd expedition and on the Southern Cross.

These generators, driven direct off the nose-motor of the plane, are wound to produce two voltages, 1,000 for the high-tension supply and a low voltage for the other side of the vacuum tubes. With them the sets can be operated continuously instead of only ten minutes out of each thirty, as is the case with the dynamotors. It has been found that in extended operation the dynamotors heat up, causing the bands on their armatures to expand and rub against the pole-pieces. Carried far enough, of course, operation in such condition puts the entire sending apparatus out of commission and it was this fact, which led to several fires, that caused the lines to decide upon changing the type of apparatus on their planes.

Moreover, use of the dynamotor requires an extra-heavy storage battery to operate it. This added weight to the plane and also cost considerable sums for battery overhaul and replacement, as the batteries would not long stand up under the heavy demands made on them. Changing over to the engine-driven double-voltage generator will permit the set to be used continuously instead of merely to be constantly ready for use.

THE old receiving equipment, which had proved satisfactory, was retained complete. The circuit of the new transmission equipment is the standard master-oscillator power-amplifier type. In fact, except for simplification, it is the same circuit as was used in the original apparatus. For instance, a number of relays weighing close to two





Left, the complete set, one of the largest ever built, is mounted (at right) in the shock-proof cradle carried in the tail of the plane. Antenna reel is in upper right corner.

pounds each were eliminated. One whole case of equipment, weighing many pounds and having 45 screw or soldered connections, was dropped entirely as non-essential. Whereas to remove one of the old transmitters and install a new one meant four or five hours of very energetic work, all of which had to be done by specialists, the new transmitter can be removed and a second set of identical type put in its place by any mechanic in three minutes, with but five connections to be made.

These are all completed at once by pushing a single five-pronged, irreversible plug into place. The new set is primarily a voice transmitter with facilities for use as a telegraphic transmitter in emergency; this is in direct contrast to the old set, which was primarily a telegraphic apparatus with voice facilities additional. Because of this, the "continuous wave" sending feature of the old set has been abandoned and if necessary to "key" the new one—that is, to send telegraphic dots and dashes with it—use is made of an "interrupted continuous wave" device.

The transmitter is a complete unit, all in one piece, and can be lifted from its shockproof rack in the tail of the plane by turning one simple catch. It weighs 29 pounds; the remainder of the 85 pounds mentioned is the dynamotor, the microphone, the wiring, and the antenna and reel. At present experiments are being made with an exceptionally light electrically operated reel.

A number of the transmitters have been built, enough to equip each plane with one and to maintain a spare at every ground station. Thus if any plane lands with its radio set functioning imperfectly, it is not necessary that repairs be attempted, with consequent delay to the plane's schedule. A new set is simply brought out and installed; the old one is placed in a special packing case, where it is locked in safe position by merely closing the lid, and it is then sent on to the base for repairs. Meanwhile the ship proceeds with a perfect set, tuned beforehand.

The set proper is mounted on shock-absorbing carriers under a small plymetyl table. The table is cased in to make a virtually waterproof cupboard, thus protecting the set, while the table-top affords a handy place for resting the spare set when making changes or serves otherwise as a convenience to the mechanics and the plane's crew.

The set has two dials; one, actuating the master-oscillator, sets the wavelength. The other controls the power amplifier. There is an arrow mark on the set and the only adjustment necessary is to turn the dial until the arrow matches a pointer on the dial. The set is tuned on the ground and the antenna resonated once in the air; this is done by the technical staff and no adjustments of any kind are necessary by the plane crew. *(Continued on Page 52)*

**This Plane Won Third Place in Race**

## Amateurs Build Own Plane

TWO young men of Norwood, Mass., Arnold F. Chamberlain and Wilfred J. Sheehan, have built the smallest airplane to obtain Federal identification numbers in Massachusetts. It is a home-made Heath Parasol, but the only ready-made parts the two partners bought were landing wheels and struts. It cost the boys but $200 to build their little ship.

A four-cylinder Henderson motorcycle engine was converted for use as the power plant. The wing spread is 25 feet and the overall length seventeen feet. The prop is four and a half feet long and its maximum width four inches. It can be spun with one hand. The engine develops thirty horsepower.

The two partners are building another small plane of midwing monoplane type with the wing just below the cockpit. The latter plane will have a 40-horsepower Anzani engine, and is expected to be thirty miles an hour faster than their present plane. The one they have now will cruise at 65 miles an hour and has a top speed of 75 miles. It has taken off in less than seventy feet, and using three-quarters throttle will take off in 150 feet. It lands at 25 miles an hour and comes to a stop within fifty feet. It uses but one and a half gallons of gas an hour, and the tank in the wings holds six gallons.

The two young men built the plane for a pastime, but later on hope to work out one of their own design for the open market.

THE Great Lakes Special Sport, here illustrated, embodies a number of new features. This ship is powered with an Inverted in-line Cirrus motor. The Inverted engine (in which the cylinders are below the crankcase) is one of the late developments of aircraft engine design. In addition to improving the visibility of the pilot, there are a number of mechanical gains made by this type of motor.

The Great Lakes ship is a popular racing plane. It was flown in the Cirrus Derby recently by Charlie Meyers, chief test pilot for Great Lakes, shown leaning on his racing plane in this picture. Charlie won third place. Prize, $3,000; Average speed, 107 m. p. h.

## School Teaches Gliding

GLIDING instruction at Parks Air College is being taught according to a definite curriculum just as are the courses in actual flying. The first classes will begin with familiarization exercises calculated to acquaint the student with the use of controls. Then will come short hops in which the glider will be launched for 200-foot flights. When the student is able to handle the glider in straight flights he will be taught how to maneuver his motorless plane in the air to take advantage of the most favorable air currents.

"The course was added to our schedule primarily because of a definite demand for the training by a group of St. Louis sportsmen who will make up the first class," Parks said in discussing the new instruction.

## New German Lightplane

AN airplane with folding wings is always of interest to followers of light aircraft. The more collapsible a plane is, the better chance we have of finding room for it in the family garage. Perhaps we may some day be able to drive to the airport and yank our lightplane out from under the rumble seat.

The particular plane pictured here was recently demonstrated in Berlin, Germany. It really doesn't occupy much room, does it?

XUM

# Practical Lessons in Flying

*By* JOHN B. RATHBUN

## Lesson III. Normal Banks and Turns

FOR two weeks Bob had been practicing dual control straight-away flights under the supervision of Pilot-Instructor Ed Keith, alternating this training by doing some work with the ground crew and gaining additional practice in taxiing about the field on an old "ice-wagon" that had seen better days. In the school that Bob Burnham attended, they believed in plenty of taxi practice to develop the feel of the controls when on the ground, hence the old "penguin" was in daily service and could be seen waddling about in all sorts of fantastic figures at almost any hour of the day. In other schools this practice is disdained, but just the same, the penguin-trained student shows the advantage of this training on his first takeoff and landing.

Nothing of importance occurred during the straight-away flights that is worthy of being detailed here. Bob was given a mark to steer to, and held the nose of the ship on the horizon as has been described in the earlier lessons of this course. So far, the turns had been long sweeping turns that required little or no use of the ailerons or controls aside from the rudder, and as all take-offs and landings were taken care of by the instructor up to this point, Bob spent most of his time maintaining the ship on an even keel and at the correct flying speed. He had learned the routine inspection of the ship that should precede each flight and in many other ways was picking up the many details that are incidental to flying.

ON this particular day they were again at the straights when the instructor introduced a little novelty into the proceedings by throttling down to about 600 r. p. m., suddenly and without warning to Bob. Almost immediately the wind stopped coming over the nose so strong while the note of the engine gave warning to Bob that he was facing a new condition. He also realized at this same moment that it is easy to understand instructions in the class-room, but when faced with the condition in actual practice, the matter does not always come instantly to mind crystal clear.

"Look at the air-speed meter," came over the phones. Bob did this and saw the needle dropping to 85, then 80, 75, 70 and down to 60 in quick succession. "Well-well-well, are we going to be all day about it," continued the phones, "wake up out of the trance and do something." And then came the idea which should have come a long time before. Forward went the stick and down went her nose into a rather steep glide while the increasing rush of air over the cowl told of increasing speed. "That's the stuff, bring her up to normal speed by diving," said the pilot, "and now look at the air-speed indicator." A glance showed that they were gliding at about 100 miles per hour, and just then Ed opened up the throttle again, and the Kiwi taking the hint,

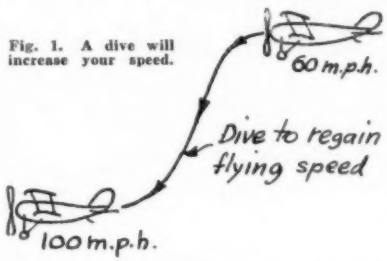



Fig. 1. A dive will increase your speed.

leveled her out into the horizontal again with her nose once more on the horizon. (See Fig. 1).

"Very good," quoth the oracle, "that last stroke of genius was a masterpiece. In fact, you are getting so good that we will have to show you some more new stunts. But for the love of Mike sit up straight and in the center of the cockpit so that you can tell whether you are wing-low or wing-high. Lopping over on one side that way will soon make you a Chinese Ace, One-Wing-Low.

"Now I am going to start on the rather weighty business of showing you how to make turns, both of the normal and flipper variety. I will go through the motions myself at the first, just as illustrations, and then will give you a chance at the job yourself. First, last and always, remember that the head resistance is increased in making a turn, and in order to keep up your flying speed it is necessary to accompany a sharp turn by a slight dive. If the dive is not practical, then open the throttle a trifle to keep the breeze coming in over the wings. Some claim that it is best to enter into the dive first before moving the rudder, while others believe that it is best to dive and turn simultaneously, but as I am a disciple of the former school I will open the ceremonies with the dive."

BOB saw the stick go forward just a trifle and then the nose dropped slightly below the horizon. Then came the rudder movement to the left, the ship wheeled around with the right wing standing up at a considerable banking angle. This turn lasted for about 180 degrees, then she straightened out with the right wing tip dropping into the horizontal once more and with the nose once again spotted on the horizon. This was very smoothly and quickly done although Bob thought that it was not necessary to stand her up on end to such an uncomfortable degree.

"There are three things to remember in making a normal turn," said the instructor, "First we must keep up the speed, second use the rudder for making the turn, and third, bank her up simultaneously with the rudder by using the ailerons. There are other ways of doing the trick that I will explain later, but just for the time being we will confine ourselves to making a normal turn. In some ways, it is like making a sharp turn on a slippery pavement with an automobile, for the car skids outwardly by reason of the centrifugal force. However, there are two more varieties of skidding with an airplane that do not enter into the management of the car, and I will demonstrate them to you later.

"An airplane is just like any other object when swinging around in a circle for centrifugal force is developed that tends to throw the ship out and away from the center of the circle. If little resistance is offered to this outwardly acting force, then the ship 'skids' outwardly. (See Fig 2). The side surfaces of a plane in horizontal flight

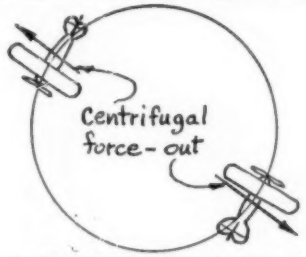



Fig. 2. If a plane attempts to turn without banking, it will skid outwards due to centrifugal force.

do not offer much resistance to skidding, hence we must bank her up so that the lift of the wings can be brought into play against this force. As a matter of fact, automobile racing tracks are banked up for the same reason, so that the wheels or supports of the car can be brought to a right angle contact with the ground."

While the pilot is getting ready for this demonstration we will show by diagram just what happens when the plane is turned around a curved path, Fig. 3 being a front view of a ship banked up on a turn. Here it will be seen that the centrifugal force acts outwards horizontally as before described, the weight acts vertically as before, while the lifting force of the wings lies along a diagonal between the other two

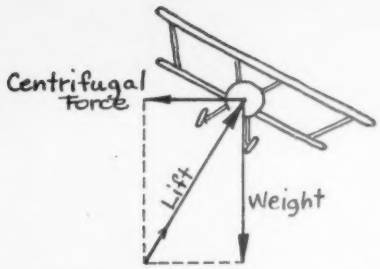



Fig. 3. A normal bank sets up a pressure to balance the centrifugal force.

forces. To develop a lifting force on this diagonal, so that the wings will resist the centrifugal force and weight, therefore requires that the wings shall be tilted up or banked as shown. If the centrifugal force is laid out to scale along the horizontal and if the weight is to scale along the vertical line, then drawing the diagonal from the corner of the rectangle gives the exact banking angle necessary to prevent skidding.

THEN Ed continued. "The turn that we just made was at 90 miles per hour and was on a radius of about 600 feet. If we wish to make a sharper turn or make a turn at a higher rate of speed, then this creates a greater centrifugal force and means a sharper bank angle. Watch this:"

Down went the nose with an opened throttle, while the speed picked up to 110 m. p. h. Then suddenly Ed gave her a good sharp rudder around a small radius and the wing tip went up until Bob thought she was standing on her

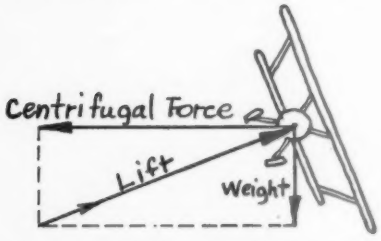



Fig. 4. A steep bank is required to counteract the centrifugal force exerted when the plane attempts a turn at high speed.

wing tips. This is indicated by Fig. 4, where the centrifugal force is shown greatly increased, and the wings are banked up until the lift more nearly approaches the horizontal to resist the greater centrifugal action. This can continue until the wings are very nearly at right angles to the horizontal, an altitude that is called a "90-degree bank." However, the wings can never be exactly at 90 degrees with the horizon for the reason that there would then be no lift component existing for overcoming the weight of the machine.

"Now in a machine of the open type, such as this," said Ed, "we know that she is banked up properly when the wind is equalized on both cheeks, or when the wind is no stronger from one side than the other. This will be just the same as in ordinary straight flying. However, if a sharp blast of wind should strike on one side of our face, then we know that the ship is sliding toward that side on either a skid or an inner side slip. Instruments known as 'bank-and-turn indicators' are installed on the instrument boards of some ships that tell the correct angle of bank or whether we are skidding or slipping.

"Now I will give you an example of a skid by a sharp turn to the left without banking her up sufficiently." Ed swung her about quickly on about an even keel, and instantly Bob felt the blast of wind on his right cheek that told of a violent outward skid. Further, he felt himself pulled to one side so that he did not seat squarely on his seat as he did on the properly banked turns or in normal straight flight.

"A bank can be too steep just as it can be too flat," explained the pilot. "I will make a gradual turn to the left this time and bank her up so steep that she will start to slide down inwardly—a condition that is known as an 'inner side slip,' and which is really more dangerous than a skid as it may lead to a spin in case that the speed should drop off."

THEN started a long slow turn to the left with the wings banked up to a sharp angle. Bob then felt the gust of wind on his left cheek and from below, telling of an inner side slip. Again he was thrown away from his solid square seating but in the opposite direction. It might be mentioned here that the displacement of the body from the vertical, and the feeling that one is not sitting squarely on his seat, is one of the main reliances of determining skid and side slips when flying an enclosed cabin plane or under such conditions that the side-air blasts cannot be felt on the face.

"It is a good plan to start the ship into a slight dive when you sense a side slip in addition to using the ailerons for correcting the bank," said Ed. "Particular care must be taken to avoid a stall when she is side-slipping, for these two conditions are responsible for spinning. Some ships tend to bank correctly automatically while others may tend to over or under-bank according to their construction, hence we must always be on the safe side and give our very careful attention to the controls when making a turn when we are flying in a strange ship. There is always a tendency toward slowing down on a turn with any ship because the increased load on the wings due to the centrifugal force increases the drag proportionately." This will be seen from a comparison between the length of the lift lines in Figs. 3-4 where the lift line is longer and indicates greater loading when the wings are banked up to the sharper angle. In short, a sharp fast turn increases the wing loading and this in turn increases the resistance to flight.

"Making turns near the ground, that is, below a height of 200 feet, will be quickly discouraged in this school—mark that," continued the instructor. "If I catch any of you birds trying to make a turn on a takeoff, I will ground you for a week, and don't forget it. It was only a month ago that a friend of mine was killed by a fool student starting a turn about 30 feet off the ground at a time when there was barely speed enough to stay in the air. There are so many things that tend to check the speed at this time that it does not pay to put the additional burden of a turn upon the engine.

"Now in making a turn, always remember that the rudder control on standard ships made in this country is just opposite to what you might expect. (See Fig. 5). With this system of con-

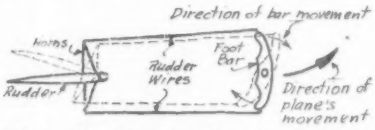



Fig. 5. The dotted line shows the position of the rudder controls when the pilot turns to his left. Note that it is opposite to the natural movement of the handle bars of a bicycle, etc.

nections the bar is pushed in the direction that we wish to go, that is, exactly contrary to the motion of a bicycle handlebar or any other steering device on land or sea. Just why this was adopted, I do not know, but at any rate it is just opposite to the instinctive movement that a fellow would make on any other craft. Pushing the right foot on the rudder bar or pedal turns the ship to the *right*. Pushing the left foot on the bar makes the ship swing to the *left*. This is one of the things that should be changed and probably will be in time to come.

"In regard to the other controls, there is an old saying, 'Right rudder—right aileron.' That is to say, when you turn to the right move the stick to the right at the same time so as to suppress any tendency toward over-banking and inner side-slips. This is not the rule with some ships, but it is near enough true for the majority to stand as a rule. 'Right rudder—right stick!'"

*Rules for Turning*

1. Slightly speed up ship by opening throttle a trifle or starting into a flat dive. If not far enough above the ground for the dive or glide, complete dependence must be placed on the engine.
2. Push rudder bar end or pedal on the same side as the turn. If turn is to be made to the right, push pedal with right foot. This must be done gently, yet firmly and uniformly.
3. At the same time that the stick is pushed forward to increase the speed, move it also toward the side of the ship in which the turn is to be made. Thus, with a right turn, move stick slightly to the right unless warned by a side gust that the ship is skidding. *(Continued on Page 56)*

## Convenient Carriage Device for Gliders

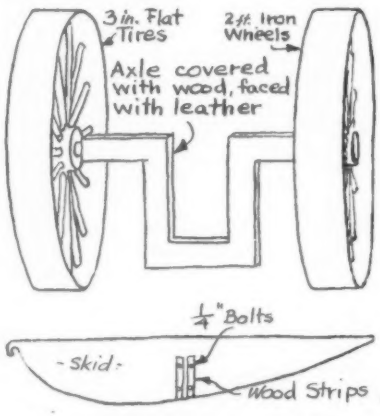
HERBERT PANCOAST of Philadelphia has a very interesting suggestion to offer his fellow readers of POPULAR AVIATION:

As everyone who glides is well aware, most gliders are not equipped with wheels. The reason is obvious, less weight. Therefore, while the actual glide in itself may be great sport, the return of the glider to the top of a steep hill certainly is not, to say the least.

And gliders have the knack of being very unwieldly to handle. Realizing this obstacle, and not wishing to further burden his craft with the added weight of wheels, young Pancoast has constructed this handy little device or retriever.

It is made of plain, 3-inch flat-tired iron wheels, two feet in diameter set on an axle, which had been shaped by a blacksmith to conform to the width of the glider's skid. The axle is made two inches oversize at the pocket, to be bolted to a wood frame, and this in turn is covered with leather to prevent marring the skid. This leather is glued on for handy replacement in case of wear.

Four 8x2x2 strips of wood are then bolted to the skid, two on each side,

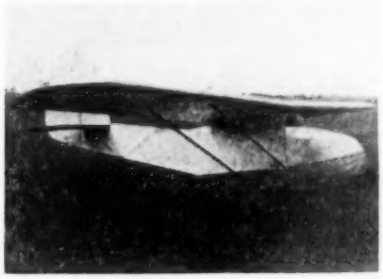



wide enough apart to form a channel to accommodate the pocket of the retriever. All we have to do then is lift the glider up, slip the retriever into place in the slots, and hook a tow rope to the glider's nose.

Herbert Pancoast and his friends find that two or three men can usually haul their craft back up the hill to the take-off place. He writes us that his handy little device can also be used to take off by auto towing, usually dropping off as the glider leaves the ground.

There are two other changes that could be made to this device, namely, fitting it out with small bicycle wheels, and making the axle with a thumb-screw attachment on each underside so that it would be adjustable to any width skid. However, the wide iron tires generally give better traction at the field.

## Hawks' Famous Glider Now on Market



THE custom-built "Eaglet" in which Captain Frank M. Hawks made his unprecedented 8-day flight from San Diego to New York has been placed in quantity production by the newly-formed Franklin Glider Corporation.

Virtually all the novel features of design and construction which made Hawks' "Eaglet" unique among its kind are embodied in the Franklin P-S-2 together with numerous improvements which heighten its performance and enhance its usefulness to glidermen. Many of these refinements are the result of a study of the "Eaglet's" performance made during the Hawks flight by Wallace Franklin, who accompanied the transcontinental "air train" in the tow ship. One conspicuous difference between the Franklin P-S-2 and its historic prototype is that while the "Eaglet" is a soaring glider, unsuited to primary training, the Franklin P-S-2, likewise of advanced type, is also intended for primary gliding and for tow.

Like the "Eaglet" it has a single, brake-equipped wheel and landing skid, a complete instrument board containing air speed, altitude and bank indicators, and release, actuated from the covered cockpit, for either shock cord or tow line.

To convert the Franklin P-S-2 from primary to secondary gliding, the "peanut scoop," or removable cowling, is merely put in place. This completely encloses the pilot except for an opening in the top of the cover through which protrusion of his head assures unobstructed vision.

Like the "Eaglet," the Franklin P-S-2 is a monoplane glider, with fabric-covered fuselage and detachable, externally-braced wood wing. Its span is 36 feet, its length 19 feet, its aspect ratio 8 to 1, its weight 200 pounds empty and its gliding ratio 15 to 1. While the custom-made "Eaglet" cost $2,500 to build, the Franklin P-S-2 sells for $675.

## Novel Pylons Used

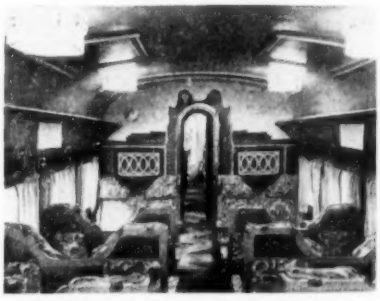
IT is a byword among cross-country pilots that if looking for a landing field, all one has to do is follow a high-tension power line and they will come to one. For many years high-tension power lines have been danger points as lofty obstacles surrounding many flying fields.

Although Curtiss-Wright-Reynolds airport at Chicago, scene of the National Air Races, was laid out in open country with all wires underground, three 84-foot towers greeted all visiting pilots. But they were not supporting transmission lines.

In the search for good strong pylons to mark the triangle of the five-mile closed course for the air races this year, so that spectators could keep the contesting planes in view from grandstand seats, extra height was required. Oil derricks such as were used at Los Angeles would not do. Neither would the wind-mills employed at Cleveland.

Captain Max M. Corpening, executive director of the races, appealed to the Public Service Company of Northern Illinois for help. They donated three high-tension transmission line towers with the crossarms removed. They make ideal pylons shrouded in checkered canvas.

## Plane Has Beautiful Interior



HERE is a very interesting view of the interior of an English transport ship. It is used for passenger service over the lines of the Imperial Airways, London, England. This company operates all over Europe but their most popular route runs from London to Paris.

## New Ship Given Free to Students

WHAT would you think of a company that offered to teach you to fly at a reasonable cost per hour in a brand new airplane and then after you had learned to fly, give you the airplane.

There is an organization that is doing just that. It is the General Aircraft Operators, Inc., headed by Major Horace Keane.

Major Keane's plan is somewhat of a club plan arrangement, whereby five people get together and arrange to take instruction, right in their own town. An experienced licensed pilot is provided, along with a new Aeromarine Klemm AKL25. When the five have completed their training they are given the airplane free of all encumbrances.

XUM

# MODEL DEPARTMENT

## How to Build the S. E. 5

*By*
JOSEPH S. OTT

DURING the Great World War the air victories that were won by the Allied Armies over the Central Powers were largely due to the great pursuit plane known as the S. E. 5 model.

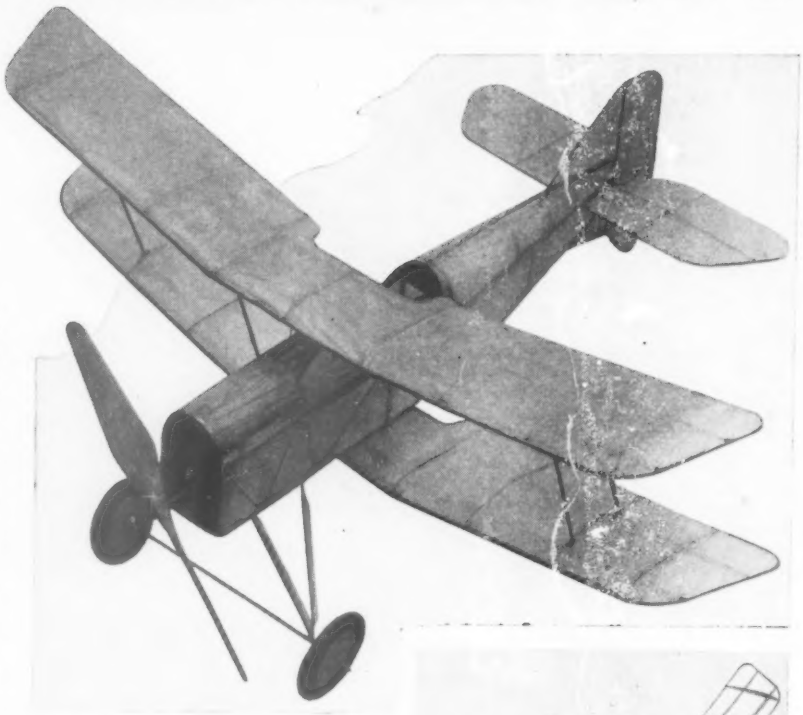
Sturdy, fast, beautiful in appearance and a dangerous foe. These planes were recognized by the large dihedral in the wings and at night the whistling of the stream-line flying wires left no one in doubt that the S. E. 5's were out.

This article, fully illustrated with drawings in detail, tells how to build a scale model of this famous British fighting plane. As a model airplane for flying qualities it is hard to excel and holds some of the world's duration record flights for scale models. It is a good model for beginners to start with for their first scale flying model. Their chances of success are assured by following all the directions as outlined, and the result will be an exact copy of the World War's best pursuit plane.

It is not necessary to study the complete drawing at first, but go over that part which is suggested in the general assembly, familiarizing yourself with the sizes and arrangement of the unit under construction. In taking each part and building it up in this way it is less confusing. The drawings and specifications were closely adhered to in building the first test model. In doing it this way all mistakes were weeded from the plans through this rechecking method and one should build this model with the utmost confidence.

*General Assembly Instructions*

No. 1 Study the drawing carefully before beginning.
No. 2 All raw materials must be cut to correct sizes as required on the plans.
No. 3 Build the body.
No. 4 Build the tail units and assemble.
No. 5 Build the landing gear and wheels.
No. 6 Build the wings.
No. 7 Build the wing struts.
No. 8 Bend the shafts and clips.
No. 9 Motor Base.
No. 10 Covering the model.
No. 11 Doping.
No. 12 Flying instructions.



Above, an actual photograph of a finished model; right a skeleton view. The S. E. 5 model is an exact adaptation of the famous British pursuit ship. Both wings are adjustable, and with minor changes, this model can be flown as a monoplane.

*Materials Necessary for Building the S. E. 5*

No. 1 Plans with full instructions.
No. 2 Fine Sandpaper Block 5" size.
No. 3 Tissue, 3 Large sheets.
No. 4 Cement, 2 oz. can.
No. 5 Dope, 2 oz. can.
No. 6 Winder (optional).
No. 7 Rubber Motor 1/32"x1/8" 10 ft.
No. 8 Pins to assist in assembly.
No. 9 2 Star Emblems, Red, White and Blue, 2 3/4" D.
No. 10 Star Emblem, Red, White and Blue, 1 3/4" D.
No. 11 Thrust Bearing.
No. 12 Shaft for Propeller.
No. 13 Rear Motor Base Rubber Hook.
No. 14 "S" Rubber Hook.
No. 15 "Can."
No. 16 Wing Clips—Front and Rear Spars.
No. 17 Nose Block Clip—for Motor Base.
No. 18 Bamboo 1/16"x1/4"x12" 6 pcs.
No. 19 Wing Adjustment Beam 1/8" x5/16"x2". (Pine)
No. 20 Propeller, 10" Low Pitch. (Balsa)
No. 21 2 Wheels 2" diameter. (Celluloid)
No. 22 Motor Base 3/16"x3/8"x15" long (Balsa)
No. 23 20 Ribs ready for use. (Balsa)

No. 24 8 Spars 3/32"x3/16"x15" long. (Balsa)
No. 25 4 Entering Edge 5/32"x5/32"x 15" long. (Balsa)
No. 26 4 Trailing Edge 1/16"x1/8"x 15" long. (Balsa)
No. 27 6 Longerons 1/8"x1/8"x24" (Balsa)
No. 28 Nose Block 3/8"x2"x3".

*Building the Body*

STUDY both the side view of the plan and the photograph of the the uncovered body, then proceed to assemble one side of the fuselage. Draw to full size and lay out on a soft pine board all the pieces that go into the side as illustrated on the side elevation of the plan.

The longerons should be pinned down first, the top next and then the bottom. Before pinning down the lower longeron apply some water to the part where it will be bent conforming to the shape desired. Then pin it down into proper position. Do not run the pins

through the parts to be held on the board, unless the pins are fine and will not weaken the part pierced. It will surprise one how easy a pinhole will cause a piece to break at the place inserted.

After the two body sides are completely cemented and dry, they should be joined by crosspieces on the top and bottom sides.

Pin the fuselage sides upside down on the board and insert and cement the crosspieces in place and allow to dry well before removing the finished fuselage.

### *Rudder and Stabilizer*

The rudder and stabilizer are made of bamboo bent to the correct shape and size. Before bending the bamboo a full-size sketch should be drawn of the part under construction.

All the crosspieces and the outlined parts should be cemented together before being put on the body.

Follow the same method of construction for the stabilizer as explained for the rudder.

To bend a section of bamboo, heat it (do not allow it to burn) at the place to be bent and with the hands and fingers form the bamboo into the desired shape. (See cut on bending bamboo). Immerse in water while holding to shape and allow to cool. When a piece of bamboo is bent and shaped it will retain its design indefinitely.

### *Tail Skid*

The tail skid is attached to the upright of the rudder. (See arrangement on drawing). The rudder in turn is cemented to the tail post of the fuselage.

### *Landing Gear*

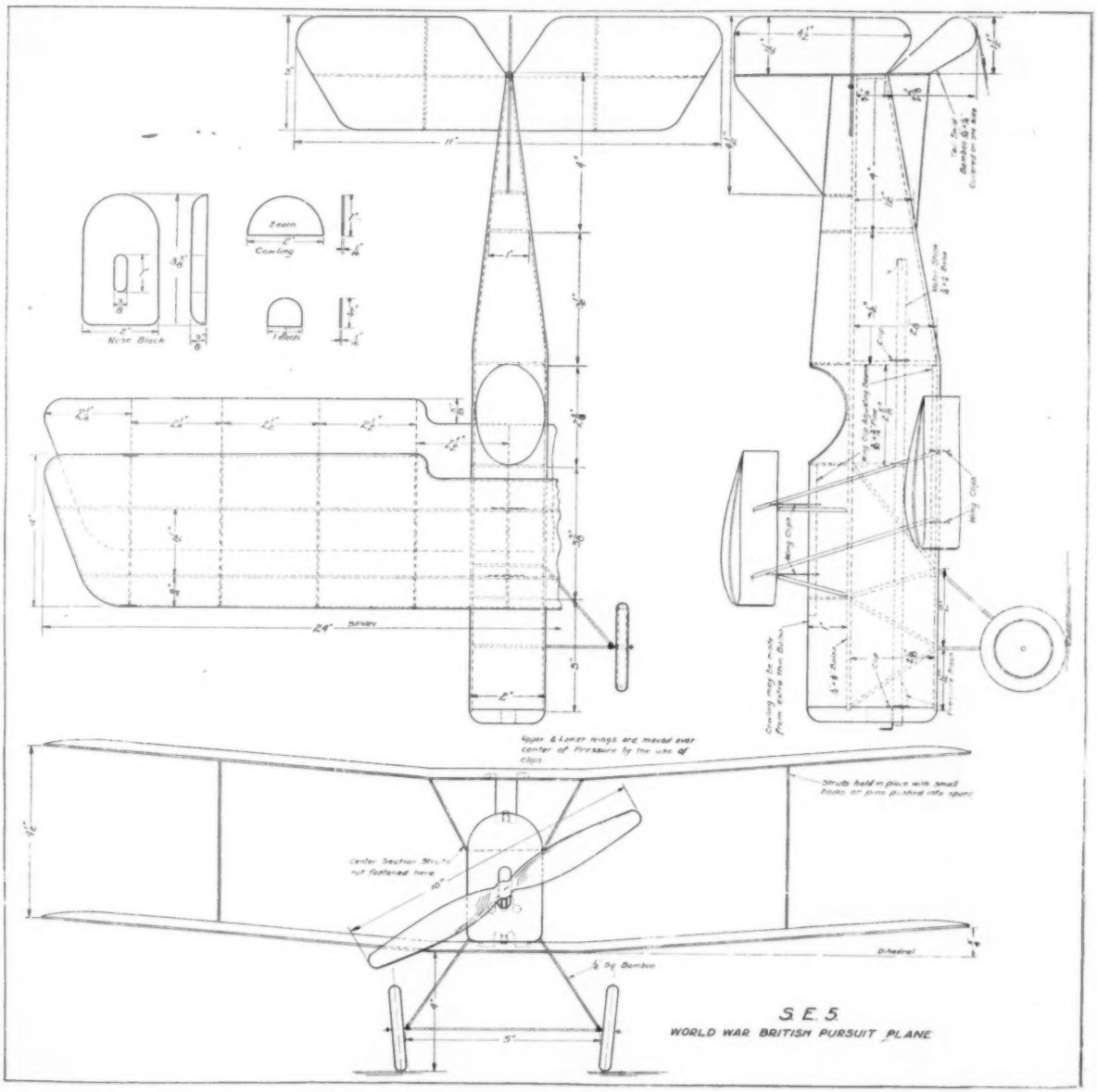
The landing gear is built up of bamboo struts glued into position. The section at the body should be reinforced with a small piece of wood or block.

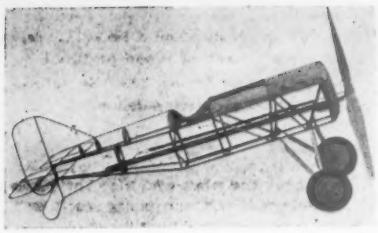
The axle-wire fitting for the wheels can be put into position later.

### *Wings*

Look over the plan and also the photo of the wings. Both wings are built with dihedral to secure the proper amount of lateral stability. Start by making the ribs. These should be cut out of 1/32" thick balsa. By making a metal template it will be easy to keep all the ribs alike. After the ribs are completed assembly with spars will be easy.

The spars should be put on a smooth board and held up at the ends with blocks, while cemented and left to dry. The plan will show the correct amount of dihedral necessary. To make the spars fit correctly they may be cut to


Nose Block
Beam
Cowling
1 Inch
Wing Cleat
Upper & Lower wings are moved over center of Pressure by the use of Clips
Struts held in place with small hooks or pins pushed into spars
Center Section Struts not fastened here
Dihedral
½ Sq. Bamboo
S.E.5.
WORLD WAR BRITISH PURSUIT PLANE



Side view of the completed fuselage before covering.

an angle at the center and a piece cemented across the center section holding them together. The center section is flat for a distance of 3 ribs. (See photo of wings.)

When the ribs and spars are in position the leading edge should be put on, then the trailing edge. It will not be necessary to apply very much cement on the wing parts while assembling, as a small amount applied properly will hold very tight.

The top and lower wings can be built at the same time across the same blocks.

Care should be exercised in putting on the wing tips as these will easily warp the wings. The tips should fit nicely into position, so no forcing will be required. This is the best way to eliminate warping.

The wing clips and center section struts should be cemented in position when the wings are thoroughly dry.

*Struts*

A small 3/16" block glued on the wing spars and projecting up against the tissue will act as a socket to secure the struts.

To prevent these from splitting, wrap some thread about them before cementing in place.

The struts are secured in position by gluing a small piece of wire or pin to each end, the wire in turn piercing the block.

The rear struts must be a trifle longer than the front ones. This is due to the lower side of the upper wing being straight and the top camber of the lower wing being down further at the rear spar.

The struts have a tendency to come out of place. A small thin piece of silk tied completely about the upper and lower wing will keep the wings snugly against the struts.

*Bending the Fittings*

All the tinned piano wire fittings should be bent to fit into the positions shown on the assembly plan. The shape of these is plainly visible and the size of the side that holds or squeezes the removable part is 1/8" wide. This dimension is the only one that is absolutely necessary to maintain.

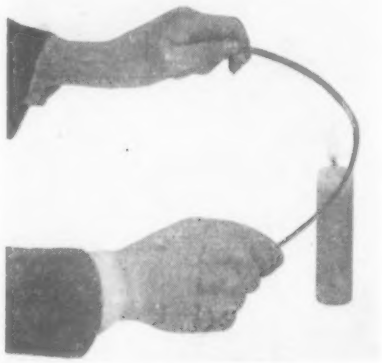
The top part of the clips should tend to squeeze the piece of wood they hold and not be a loose fit and permit it to slip out while in flight.

When the motor base is removed the rubber can be stretched out while winding and in this way increase the turns or r. p. m. of the propeller—this in turn will give a longer flight.

When winding the rubber with a motor stick arrangement, the possibility of breaking the fuselage in case the rubber snaps is eliminated. The use of a stick in this case is an added safety feature, over having the fuselage act as a motor base. The side view of the fuselage (see cut) clearly illustrates the motor base and all arrangements, showing how easy the stick is taken out and replaced.

*Covering the Model*

Cover the body first. If the tissue is wrinkled very much a good plan is to iron it. In this way the tissue will be very flat and the moisture will be absorbed by the heat of the hot iron. When paper is ironed before being used, there will be no tendency in drawing up and warping the parts out of shape. The heated iron contracts the paper and it should be used for covering as soon as possible after being ironed. Most models warp out of shape simply because the tissue is put on when it is in a sort of expanded condition. This is especially true when it is damp.

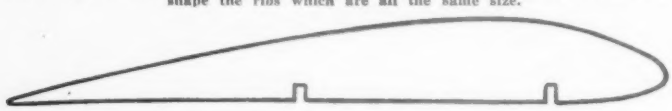


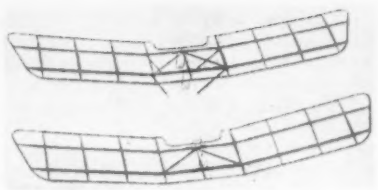
The proper method of bending split bamboo.

After the body is covered proceed with covering the tail units. Here is where the greatest care in covering should be exercised. The tail units are made from continuous sections of bamboo for the outline, with only one or two crosspieces.

Because of the simplicity of construction, securing rigidity of these parts is quite a problem. Therefore covering these units and keeping them even is a little tricky job to be proud of.

This full size rib section may be pasted on sheet metal, cut out with heavy shears, and used to shape the ribs which are all the same size.





The wing structure is clearly shown in this view of the two wings in their proper relative position.

The wings might seem to be a little hard to cover, but by covering one section at a time it simplifies itself. The center section should be covered on the top side first, then the left and right section of the wing.

When covering the left or right section lay the wing down on an even surface and when applying glue to the tissue do not pull one corner of the tissue too tight and cause the wing to get out of shape. After the top side is covered completely, inspect the wing from a position in front of the leading edge. Make sure that all the sides have been kept even.

Check up and be sure that there is no warp on either side. If both sides are warped up or down just a trifle the wing can pass inspection. The most trouble in flying will be if one side is down and the other side is warped up.

When the top side is covered correctly, the lower side will be very easy. Allow a small cut out section about each fitting. These may be closed up with small sections of tissue applied with dope and the use of a brush.

*Doping the Covered Model*

After the model is completely covered the next step is to apply dope over all the tissue covering. Correct preparations are obtainable everywhere. This dope is applied with a wide soft camel's hair brush.

Brush crosswise over the surfaces and as evenly as possible. If the dope is not put on evenly the tissue is apt to draw too tight and warp the wing or pull the wing tips out of shape.

If the covering on the tail unit is a little loose and it seems that they should be doped—use a half strength dope, by mixing thinner and dope 50-50, the correct strength will be had.

Now the model is ready to receive the motor stick with the propeller attached. Checking over the motor stick, the correct amount of rubber strands should be about 10 lengths up and down from the propeller shaft to the rear hook. This will call for about 10 feet of rubber 1/32"x1/8". The "S" hook may be used in conjunction with a winder. By stretching out the rubber twice the length of the motor base and gradually coming back as you wind, more turns and a steadier supply of energy will be stored into the rubber motor. The correct amount of turns will number about 250 to 350. In some cases models will fly on 6 strands.

*Preparing the S.E. 5 for Flight*

Both wings on this model are adjustable and this *(Continued on Page 57)*

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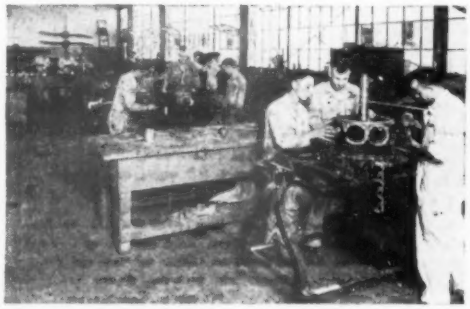

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# WOMEN'S ACTIVITIES

EDITED BY LADY MARY HEATH

SUNDAY, June 8, an airmeet was held at the Pittsburgh-Greensburg Airport, when a Baker-McMillen glider was awarded by the Women's Aviation Association of Pittsburgh.

Miss Amy Johnson, who recently flew to Australia, and who beat Bert Hinckler's time to Karachi, has been given a new airplane—a Puss-Moth—by the De-Haviland Company. She has also accepted an offer of a large newspaper to tour Great Britain lecturing for it. Miss Johnson's machine, which she used in her momentous flight, was the Moth machine which Capt. Boyd used two years ago in making a flight of nearly 25 hours. Miss Johnson has been presented with a No. 1 Civil Air Pilot's license of Australia as well as the C. B. A.

There are now 277 licensed women pilots in America with 24 transports; 33 limited commercial and the remainder private licenses.

The King's Cup air race, probably the greatest in Europe, was held last Saturday in England. A long course was scheduled, and the race was won by Miss Winifred Brown, who has been consistently flying machines which were originally made by Messrs. A. V. Roe.

Miss Marion Clark was recently elected president of the Women's Flying Club of Maryland.

Mrs. A. L. Williams, wife of the famous American speed pilot, is now learning to fly herself.

A meeting was held last week of the 99 Club in Cleveland. Mrs. Thaden and Miss Amelia Earhart were guests over night of Mrs. Blanche Noyes. The race will be divided into two portions, one course for light machines and the other for heavy high-powered machines.

A stipulation with competitors for 150 solo work instead of 200 has gone through.

Miss Mildred Kauffman, who has acted as demonstration pilot, unfortunately had an accident when flying on the 17th of June at Fairfax, Kansas City, but was unhurt herself.

Mrs. A. M. Gilmore of Los Angeles, who is just 92, had an airplane ride for her birthday present—she loved it.

Miss Martha Candler of Atlanta, Ga., chose an airplane for her graduation gift—she got a beauty.

Representative Edith Nourse Rogers of Lowell, Mass., plans to fill all her speaking dates this summer by airplane.

Miss Jean La Rene, staff pilot for the American Eagle Corp., recently ferried a new machine from Kansas City to Canastota, N. Y. She has been all the way across the United States in this type of machine.

Miss Mary Billy Quinn, of Long Beach, Cal., who recently finished law school, has now qualified for her L. C. license.

Mme. Maryse Bastie, former holder of the Women's World Endurance record, has just failed in an attempt to regain it at Le Bourget. Her plane ran out of gasoline after 22 hours and 27 minutes in the air.

Mrs. Hartly, who is great-aunt of the Blackburn brothers of the Blackburn Corp. in Yorkshire and who is 89, has been doing considerable flying recently in the Blackburn "Bluebird." She flies in neither helmet nor goggles but in ordinary clothes. She says that she gets a big kick out of flying.

On Whitsunday and Monday an Aviation Meeting was held at Vincennes. There was an Aviatrix race in which Mlle. Lena Bernstein was the only entrant. Flying a machine equipped with 230 horse power Salmson, Mlle. Bernstein covered a course from Vincennes to Etampes and returned, a distance of 65 miles in about 52 minutes.

---

*We have just received word from Lady Heath that since her return to England she will be unable to continue as editor of this column.*

*Several prominent women flyers have volunteered to act as Women's Editor, and Lady Heath's successor will be announced shortly.*

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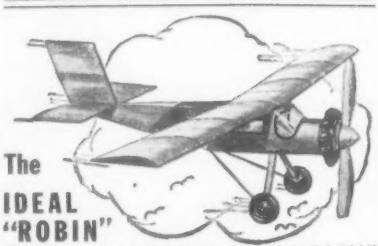

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Aviation is putting hundreds of men into headlines. And, while every man who goes into Aviation today may not reach the headlines, (though his chance is as good as the next fellow's) he certainly **can** stay out of the breadlines. And what is more important, he can make a mighty good living **at** the world's most interesting work.

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If you are one of the many serious-minded, ambitious men who want to get into Aviation but can't afford to leave their homes and jobs to get the necessary training, Hinton can help you. He'll give you his practical Aviation training right in your own home, in your spare time. And when you have completed his thorough course of training—his nation-wide, nationally advertised free Employment Department will help you get a job in Aviation—just as it helped Dobbins, McCollum, Bergen and scores of others.

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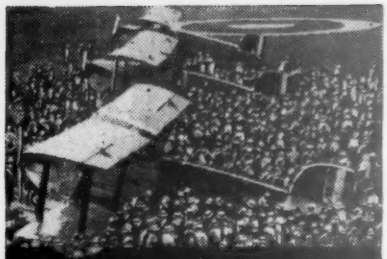

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## Crashing Planes for the Movies *(Concluded from Page 25)*

crew. This most important detail is always under the command of a man in whom I have implicit confidence—a naval engineer by the name of Harry Reynolds. Harry gives each of the men just one implement of rescue. Some have pliers and nippers. Others have hack and wood saws, or sledges, wire-cutters, axes. Only on word from their commander are they allowed to approach a wreck and then but one works at a time. It is an extremely quick and efficient system.

Hand in hand with the rescue crew is the fire detail. Two forty-gallon chemical tanks and half a dozen three-gallon fire extinguishers are adequately manned by men experienced in fire fighting. Besides chemicals, the crew is equipped with shovels. If the crash is to be in water a pulmotor is on hand.

A doctor and nurse with emergency kit are near a waiting ambulance or standby car. No detail is overlooked.

One of the most important of all is the force used to control the onlookers. My orders are that no matter how badly I should be injured, no one is to enter the roped-off danger area until the motion picture effects are secured.

Sometimes it is extremely difficult to manage the nervously pitched spectators and the well-wishers of the troupe. On "Wings" we used as many as a thousand soldiers to police the war-stricken area and the crashed airplane. Now a skeleton of a crew along the ropes seems sufficient. However, no one knows even to this day what a crowd would do if I should ever be pinned in a broken fuselage, unconscious, and have that wreck take fire. Therefore I take no chance. A sufficient number of police will always be on duty. An excited mass of people could but hinder a rescue and I am sure that no matter how badly the cockpit were entangled, it would take no more than thirty-five seconds to get me out.


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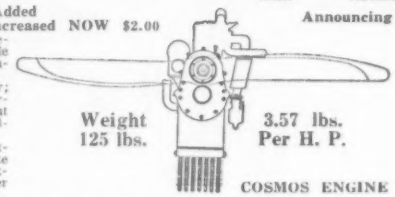

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## How to Become a Naval Aviator *(Continued from Page 36)*

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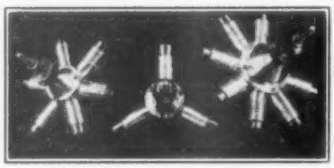

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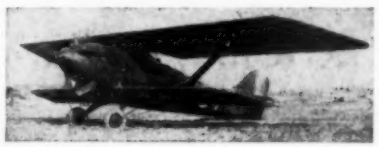

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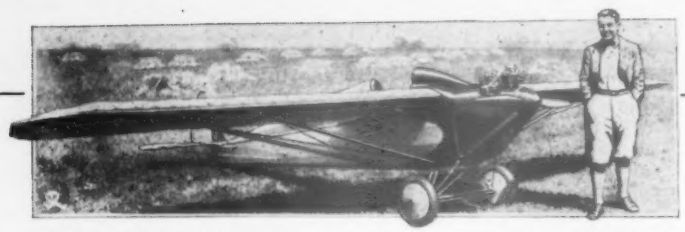

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*(Continued from Page 40)*

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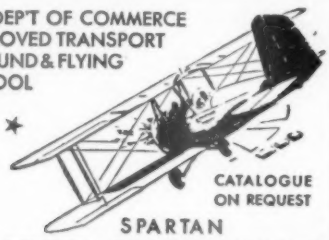

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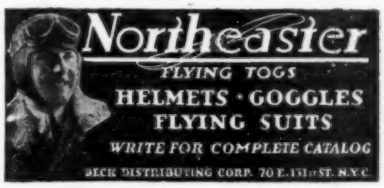

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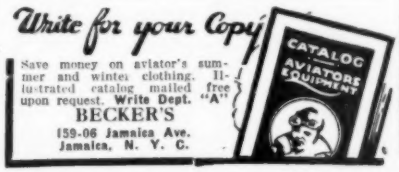
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## The Rhon Ranger

*(Continued from Page 28)*

as the fin at the right angle is 1/8" thicker than the top longeron. When this has been done, carefully measure the distance from the center of the bolt or hole to the side of the fin, and bend the bracket so that it will just meet the fin when it is bolted to the spar.

The strap hinges and wire-pull fittings for the stabilizer brace wires are not put on until the tail members are covered.

*Instructions for Rigging and Covering*

RIGGING THE WIRES: Set the glider up by means of props and supports so that it assumes its natural shape. Measure the length required for the landing-wires (above the wing) with a tape measure, allowing about five extra inches at each end for bending the loops. Cut off the four wires by notching with a file and breaking. Make the loop at one end only as follows: Clamp two twenty-penny spikes in a vise 1/8" apart; slip one end of the wire about four inches between the spikes, and bend the projecting end back to the shank of the wire; now bend the shank a little in the opposite direction to make the center of the loop line up with the shank of the wire. Hold the short end tightly against the shank, and slip a ferrule (J-15) over the two wires, tap it up tight against the loop, and then bend the short end back over the ferrule. Cut it off even with the end of the ferrule which is against the loop.

Set a turnbuckle in "neutral" (midway between its greatest extension and its minimum). Attach this turnbuckle to the loops just made with a 1/4"x3/4" bolt (J-21), then attach the other end of the turnbuckle to the cabane with a similar bolt. Stretch the wire straight to the wing-anchor for this particular wire, and mark the point where the center of the loop will be. Slide THE OTHER FERRULE ONTO THE WIRE before you bend it. When this is done, proceed with the loop as previously described.

When all four landing wires are made and attached, test them to see that they hold the wing straight (sight along the leading and trailing edges) and still have a little extra take-up left in the turnbuckles. Proceed in the same manner with the flying wires, etc.

In making the control wires, set the stick in neutral and the ailerons and elevators horizontal when measuring for the wires.

To put the thimbles (J-11) in the flexible cable (J-10) bend the cable tight over the thimble and about two inches back along the shank, and bind tightly with fine wire. This should then be soldered in place, all along the binding.

WARNING: Never cut the flexible cable without first binding it with wire on both sides of the cut to be made; if this is not done, the cable will spring out of twist before you can stop it.

COVERING: Cut eleven pieces from the fabric, each ten feet nine inches long. Tear one piece down the center, and sew five and a half pieces together side by side, for each wing. This must be done on a sewing-machine, lapping the seams 1/2" and stitching in two parallel lines along the edges of the

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seams. Stretch the edges very tight while running them through the machine, as the stitching tends to contract the edges and wrinkle the fabric.

Lay the large sheet of fabric just sewn over the wing, starting from the trailing edge, over the front and back to the trailing edge again. Pin the fabric together at each rib, just tight enough to take up any slack. Next put tacks about six inches apart through the fabric into the root-rib, on the edge of the rib, not the top. Leave the bottom free for the present. Next stretch the fabric tightly at the wing-tip and tack it in place. Remember, the fabric must be very tight from end to end of the wing, to prevent it from sagging between the noses of the ribs when the dope is applied. From leading to trailing edge it needs only be tight enough to make a smooth job. Now turn the wing over and repeat the performance for the under side.

While working on the wing, it is best to lay two straight strong planks across the horses, about two and a half feet apart, so that the ribs will be evenly supported. Don't let all the weight of the wing fall on just two ribs.

When the fabric is tight all over the wing, go over all the tacks again and fill in any gaps more than two inches

Tack the fabric to the ribs where the rib-struts meet the capstrips, both top and bottom. This must be done carefully with a light hammer, as there can be no deadstop under the wood.

TAPING: Cut lengths of tape (K-5) ten feet seven inches long, one for each rib. Pour about a quart of dope (K-7) into a clean can, and with a two-inch brush spread dope along the top of each rib, one at a time, and immediately lay the tape on the rib, pressing it into the wet dope. Brush more dope on top of the tape to make it stick down firmly. Don't slop the dope on too thick, as the tape won't stick any better, and you may run out of dope if you are careless with it.

When the tapes are all put on the top, turn the wing over and dope the tape to the underside of the ribs also.

All edges or parts where tacks have been used should be taped in this manner. At the aileron gaps we suggest you tear two-inch strips from scraps of the fabric and use them for tape, as the extra width gives you a better job.

IN USING DOPE, always have plenty of ventilation; never smoke or allow fire to be in the same room. DON'T WASTE THE DOPE! Five gallons are sufficient to cover the entire glider with two good coats if used properly. When stopping work for the time being, leave the brush in the can of dope, covering the top with paper to prevent excessive evaporation.

(If you wish to lacquer your glider according to any special color scheme, buy aircraft lacquer. Don't try to use ordinary paint or varnish; you won't get a good job.)

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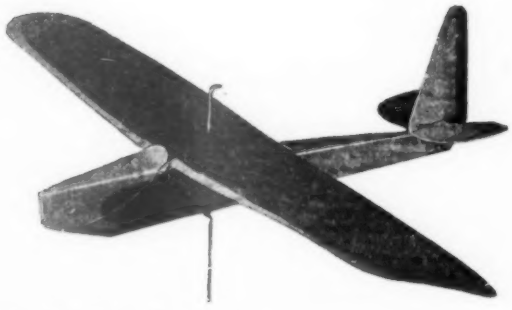

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## Practical Lessons in Flying

*(Continued from Page 42)*

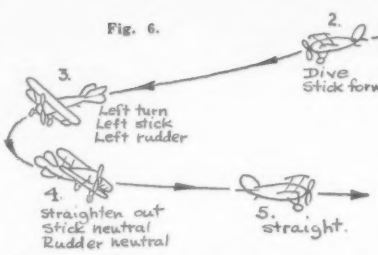
Fig. 6.
1. Straight
2. Dive Stick forward
3. Left turn Left stick Left rudder
4. Straighten out Stick neutral Rudder neutral
5. Straight.

FIG. 6 shows the five leading positions in making a left-hand turn, starting at position (1) and ending at position (5) with the stick and rudder positions noted at each step. This turn starts with the flat dive at (2), bank and turn at (3), straighten out with controls in neutral at (4) and finishing in the horizontal at (5).

"When the turn is banked up so steep that the wings stand at an angle greater than 45 degrees, as in Fig. 7, then the controls become 'inverted,' and the ship is said to have made a 'flipper turn' because the elevator or 'flipper' now acts like the rudder. Instead of lying in a horizontal plane, the steeply banked elevator or 'flipper' approaches a vertical position, and we now steer with the elevator instead of the rudder, meantime employing the rudder as the elevator. Unless this is carefully studied, a flipper turn at an angle greater than 45 degrees is likely to become confusing and may end in trouble."

Having imparted all of these verbal instructions to the student, Ed then went through the routine twice so that Bob could grasp the practical applications of the maneuver. This was varied by alternate right and left turns, figure eights and flipper turns until Bob had fully assimilated the subject. In our next lesson we will take up a few special matters on the subject of turns together with some new stunts that feature in flight instruction. And now we will leave them going through "RIGHT"—"LEFT"—"RIGHT," and so forth. There is a whole lot to making turns.

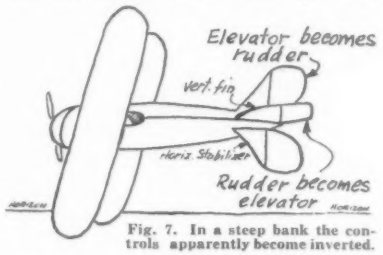


**Fig. 7. In a steep bank the controls apparently become inverted.**


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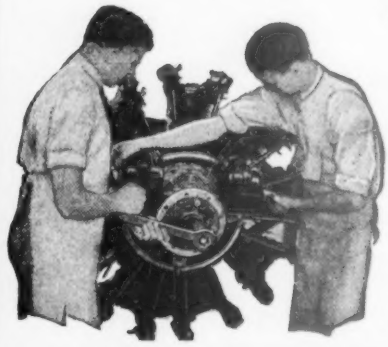

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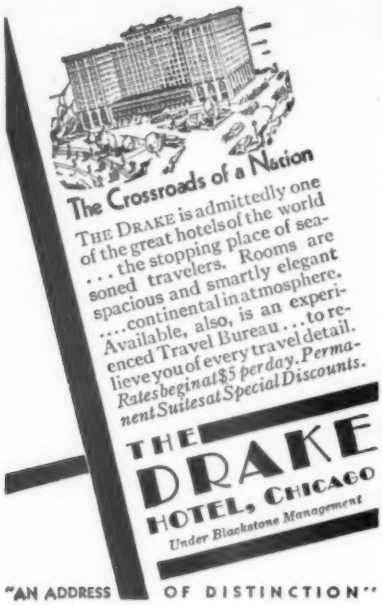
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## Model Department *(Continued from Page 46)*

will be a very valuable method for use in securing the proper flying balance.

So far no biplane model has had adjustable upper and lower wings. This brings a new idea to model building. It does not seem quite possible that a small movement of only 1/8" or 1/4" would be sufficient to balance a model, but if the wings were non-adjustable the need of the clip arrangement would be greatly desired.

The approximate center of balance must first be found by placing the complete model, wings, motor, stick, rubber and propeller on a sharp edge or across the forefinger.

After securing the position of balance in this way, move the center of the lower wing directly over the point of balance. The approximate correct position of the top wing should be in position as on the plans.

Glide the model, launching it by hand and readjust the wings until it makes a very steady glide. In most cases the movement of the top wing forward or backward will give the correct balance.

Be sure to keep a fairly large amount of stagger in the wings. This will assist in keeping the model from diving too fast after the rubber is unwound.

Wind up the rubber about 75 to 100 turns. Try a few short flights before attempting to use all the available power. When the model performs well through this test, it should be ready for a full-time flight.

Best flights will be secured by winding with a winder as explained before. In some cases the model has flown twice as far and long as is possible by hand winding.

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| Peel Glider Boat Z-1 | 595 |
| Crawford's Powered Glider No. 2 | 600 |
| Dragonfly | 650 |
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| Franklin P-S-2 | 675 |
| McGill B-1 | 795 |
| Bowlus Albatross Sailplane | 975 |
| Crawford's Powered Glider No. 1 | 975 |
| Woerner Sailplane | 1200 |
| Wichita Soaring Plane F-1 | 1250 |
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## An Airy Chat with the Editor

*(Continued from Page 10)*

book I was looking for." Don't be impatient, the name of the book is "A Narrative History of Aviation," by John Goldstrom. John, by the way, started writing his articles for POPULAR AVIATION more than three years ago.

While we are on the subject of books, some have asked for the title of a book on Gliders. If you want a complete non-technical book on this subject read Henley's ABC of Gliding and Sailflying by the well known authority, Major Page.

---

AERONAUTICS used to maintain a Buyer's Mart Column, which gave free listing to those who wished to purchase planes or gliders. Would you like us to start this department again? If so, send complete particulars about the type of plane you wish to buy and how much you can afford to spend.

To start the column off: H. Ide O'Brien, General Delivery, Williamsville, N. Y., is in the market for a used lightplane, preferably a Heath Parasol or a Velie Monocoupe.

---

R. B. KITCHIN has asked for, "some dope on the inners of the Aeronca plane, as I would like to buy plans and material to build an Aeronca."

Sorry, R. B., but the Aeronca people don't allow it. To quote Mr. Eichhammer of that organization: "The Aeronca is not sold 'knockdown' . . . . The plane, embodying a 6½ safety factor, necessitates careful and skillful construction.

---

DID you know that POPULAR AVIATION is read all over the world? Even the aviation adviser to the Chinese Government is one of our subscribers.

Among other foreign letters received this past month was one from Michael Cipriani of Trinidad, British West Indies. Says Mike:

> *"Allow me to congratulate you on the splendidly got up issue of 'Popular Aviation' of August, 1930. I enjoyed every article contained in it and hope that the future issues will be just as good.*
>
> *"There is, however, just one complaint, in some of the articles describing the marketing of some new light plane, there does not appear the address of the manufacturer.*
>
> *"I am a licensed British pilot and I am hoping to commence private flying on a commercial basis in the West Indies.*
>
> *"I desire to have the cost of the plane or power glider, F. A. S. New York, export discounts, etc. Prices must be sufficiently inductive to warrant the marketing here over English planes which are duty free. American planes are subject to 10% duty plus 10% surtax."*

Mike specifically asked for the addresses of several manufacturers whose products were described in the August issue. Naturally we furnished him with the addresses requested. What do you American readers think about this—shall we, or shall we not list addresses? While this controversy continues, we will be very happy to forward any letters sent to us, intended for the manufacturer of a product described in POPULAR AVIATION.

---

THERE seems to be quite a number of women who have taken to parachute jumping. Miss Bernice Stone writes us that she "would like to travel around the country doing chute jumps but am unable to get any data on Air Meets." Gosh, Bernice, we'd be mighty glad to list every carnival, race or meet that is held anywhere—but how many of our readers live your kind of life? We'll let it rest with them—if enough readers write in requesting a list of air meets being held each month, Bernice can have her way.

Betty Mathis of South Bend is also


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a high jumper. She has a 5,000-foot jump to her credit and is desirous of breaking the altitude record now held by a male jumper.

JOHN B. Rathbun's article last month on "500 M. P. H. Can't Be Done," has certainly stirred up considerable excitement. The issue has been on the stands only a few days, but the ripping comments have already begun. Lt. Waldo Tullsen, stationed at the Pensacola Naval Air Station, has given us a clear analysis on this controversial subject in an attempt to prove that Mr. Rathbun is all wet. The Lieutenant has had some first-hand experience with the speeds of bullets, and makes free use of mathematics to prove his point. It is too late to give you his article this month but will squeeze it in the next issue. And maybe we'll get Rathbun to answer him at the same time.

ARMAND DUVAL was disappointed in not finding John B. Rathbun's "Lessons in Flying" in the August issue. "If you wish to keep one of your readers from getting gray headed please advise me as to how I can get the rest of the story."

Armand no doubt found what he was looking for in the September issue, and for his benefit, be it known that the series will be continued uninterrupted henceforth.

LEO KORNHEISL has asked for an article on the traffic laws of aviation. You're welcome, Leo, you'll find what you want in next issue. . . . And Glenn Condon of Skelly Oil wires us that down in Oklahoma, an airline operator was granted a permanent injunction against the State of Oklahoma from collecting tax on gasoline used in airplanes. That's mighty good news to the many amateur flyers and independent barnstormers who have to operate their planes cheaply. . . . William M. Preston would like an article on airplane engines. Bill, I have a darn good story on engine types, but there isn't much room for it this month. Suppose you sit tight for a month or two and then we'll squeeze it in somehow.

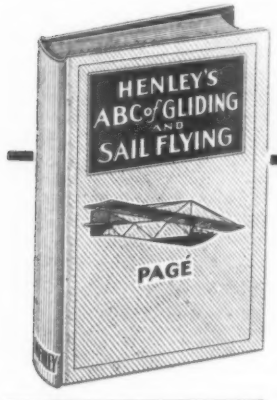
DO you remember W. L. Oliver? He was president of the Menefee Air Service and author of "Airplane Mechanics Must Be Foolproof" which appeared in the June issue. Perhaps you would be interested in what he has to say about the August issue:

*"The most interesting feature in the magazine to me was the reprint of the damaged Nieuport, with Captain Bursey's own story of the landing. Stories like that will thrill any class of readers. The next most interesting feature, after the story of Immelmann, was Lieut. Webb's story of aircraft carrier pilots. If he had pepped it up with a few more actual incidents of flyers who nearly missed the deck, I would have liked it better. But it was good enough as it was and was throughly readable.*

*"Your flying club article by H. A. Speer in the August issue is interesting here in Richmond, where there is an active but somewhat impoverished club of gliding enthusiasts. These boys have recently built their own glider and have had some success with it, but they are all anxious to move on up into motored flying. They will form a good circulation nucleus for you here, I think, as soon as they find out what you are doing in the glider and flying club field. Sometime ago, in my absence from a meeting, they elected me president of the club."*

THERE was so doggone much to tell you about this month that I am running out of space. I would like to print in full every letter received from readers, but there wouldn't be much for anything else. Suppose we compromise and close this month's column with thanks to the following for their interesting comments: Lloyd La Plant, Archie Swan, Jr., Edward Leppig, Gus Anderson, George E. Adams, Billy Bibler, Howard Johnson, Chester Briggs and Stanley Lenard.

—B. G. DAVIS.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Gentlemen:

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Yours,
V. Szeligo

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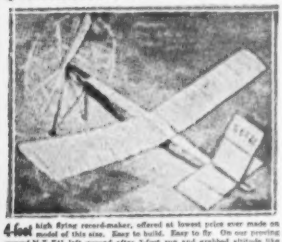

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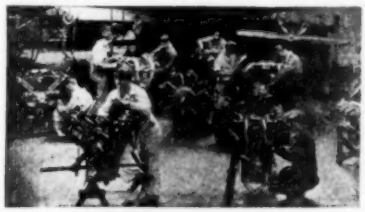

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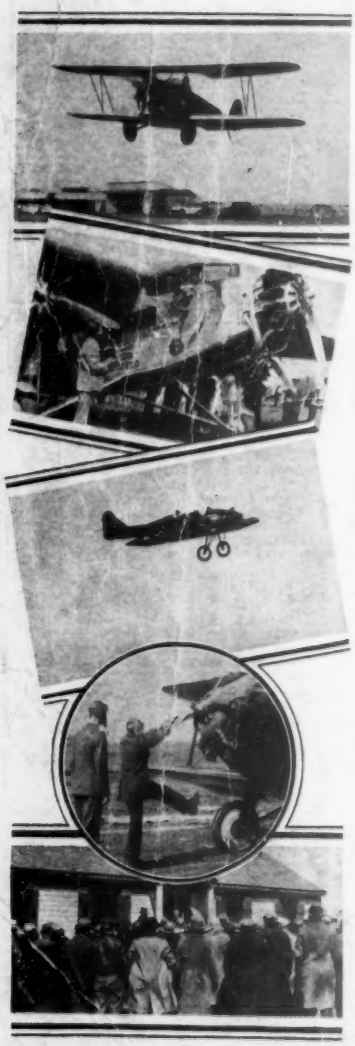

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